The State Electricity Authority (SEA)
Hydrological Survey

ÞJÓRSÁ AND HVÍTÁ RIVER SYSTEMS
SOUTHERN ICELAND
SOME HYDROLOGICAL ASPECTS

by Sigurjón Rist, hydrologist, SEA
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Reykjavík, June 1959

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LIST OF ABBREVIATIONS AND SYMBOLS

Vhm	=	vatnshæðarmælir = water gauge
a	=	year; yearly
m	=	month, monthly
d	=	day; daily
h	=	hour
s	=	second
kl	=	kilolitre (= 1000 litres = 1 m^3).
Gl	=	gigalitre (10^9 litres = 10^6 m^3)
Q	=	discharge, kl/s = m^3/s
Q_{50}	=	discharge available 50% of time (longterm value)
Q_{75}	=	" " 75% " " " "
Q_{95}	=	" " 95% " " " "
Q_{a50}	=	discharge available 50% of a year
Q_{a75}	=	" " 75% " " "
Q_{a95}	=	" " 95% " " "
MQ	=	mean discharge (longterm mean)
MdQ	=	mean discharge over a period of 1 day
MmQ	=	" " " " " " 1 month
MaQ	=	" " " " " " 1 year
HQ	=	max. discharge
HdQ	=	max. discharge in a period of 1 day
HmQ	=	" " " " " " 1 month
HaQ	=	" " " " " " 1 year
HaMdQ	=	max. yearly value of a daily average of discharge
LQ	=	min. discharge
LdQ	=	min. discharge in a period of 1 day
LmQ	=	" " " " " " 1 month
LaQ	=	" " " " " " 1 year
LaMdQ	=	min. yearly value of a daily average of discharge
$\sum$Q	=	run-off; (accumulated discharge)
$\sum$dQ	=	total run-off over a period of 1 day
$\sum$mQ	=	" " " " " " 1 month
$\sum$aQ	=	" " " " " " 1 year
M$\sum$aQ	=	longterm mean of annual run-off
q	=	discharge per sq. km of drainage area = specific $l/s\ km^2$
Mq	=	mean specific discharge
Mmq	=	mean specific discharge for a period of 1 month
Maq	=	" " " " " " " 1 year
°C	=	degrees Centigrade
S	=	a lake and its effect on the flow of a stream
D	=	a dragá or "direct run-off" stream, or a drainage area feeding a dragá stream
L	=	a lindá or "spring-fed" stream or a drainage area feeding a lindá stream
J	=	a glacial stream or glaciers
D+L+S+J	=	substantially a dragá river, but spring fed to some extent. The flow is somewhat evened by lake(s) and the river contains a small amount of glacial melt water
,	=	decimal point

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SUMMARY

The present paper deals with the hydrology of the Þjórsá and Hvítá river basins in southern Iceland.

The paper is based on the work of the State Electricity Authory´s Hydrologic Survey over the past 12 years.

After a short introduction a description is given of the main types of Icelandic streams. The streams of Iceland may be divided into two main groups: (1) Glacial streams and (2) bergvatnsá or "non-glacier-fed" streams. The latter group may then be divided into two subgroups: (a) Dragá streams, deriving their water mainly from surface run-off and (b) Lindá or spring-fed streams, being fed essentially by ground-water. This subdivision is of geological origin; the dragá streams are most frequent in areas of watertight bedrock, e.g. basalt, the lindá streams, on the other hand, mostly confined to areas of pervious formations, such as postglacial lavas, palagonite rocks, glacial drifts, etc.

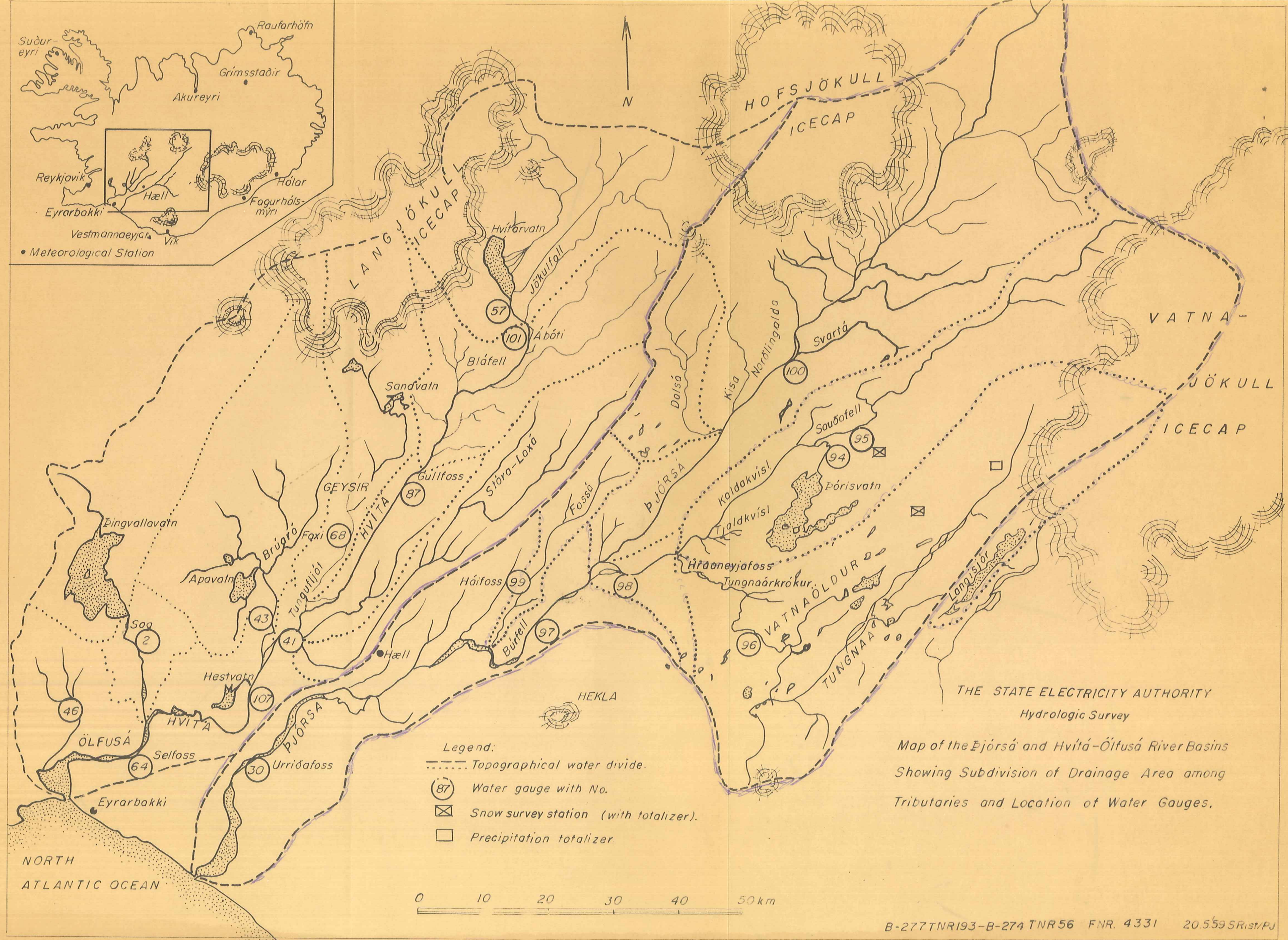
The main features of the climate of Iceland are described, with examples being given of 30 years averages of temperature and precipitation at various locations. The Icelandic climate is a rainy island climate and very fluctuating, especially in the south of the country, with relatively mild winters and cool summers. Meterological observations are available from the inhabitated lowlands only, so that very meagre information is available on temperature and precipitation in the central highlands.

Systematic hydrological survey of the two basins began in 1947, at first in the inhabitated lowlands, later to be extended to the highlands. At present, water level recorder have been installed at all the most important locations in the two river basins.

The ice conditions in the two river basins are described. The ice formation in the three stream types, glacial, dragá and lindá streams differ appreciably from one another. As the Þjórsá and Hvítá and their tributaries are to a more or less extent a mixture of the various types, their ice conditions may sometimes be rather complicated. In some places, ice barriers may be formed in the rivers, causing an appreciable rise in the water level.

A short discussion is given of floods in the two river basins. The period of record is still too short for an analysis of the flood frequency to be made. According to their cause, floods may be classified into 5 groups:
(1) Spring floods caused by snow melting. (2) Winter floods caused by heavy rainfall coinciding with an intensive snow melting. (3) Floods caused by rainfall alone. (4) Floods caused by the bursting of an ice barrier in the river. (5) Jökulhlaups, a sudden outburst of water from under a glacier, caused either by water breaking its way under a glacier dam at the mouth of a side valley, or by subglacial volcanism. Stream-flow records are available for 5 water gauges in the basins for a period of 7-11 years and for 18 years for the 6th gauge.

These records are summarized in tables and diagrams at the end of the paper.



Suðureyri
Raufarhöfn
Grímsstaðir
Akureyri
Reykjavík
Hólar
Hæll
Eyrarbakki
Fagurhólsmýri
Vestmannaeyjar
Vík
• Meteorological Station
N
HOFSJÖKULL
ICECAP
LANGJÖKULL ICECAP
Hvítárvatn
Jökulfall
Ábóti
Bláfell
Sandvatn
Svartá
Norðlingalda
Kisa
Dolsá
VATNA-
JÖKULL
ICECAP
Sauðafell
Kaldakvísl
Þórisvatn
Tjaldkvísl
Hrauneyjafoss
Tungnaárkrókur
VATNAÖLDUR
Langisjór
TUNGNAÁ
ÞJÓRSÁ
Fossá
Stóra-Laxá
Gullfoss
GEYSIR
HVÍTÁ
Faxi
Brúará
Tungufljót
Apavatn
Þingvallavatn
Sog
Háifoss
Búrfell
Hæll
Hestvatn
HEKLA
ÖLFUSÁ
Selfoss
Urriðafoss
Eyrarbakki
NORTH ATLANTIC OCEAN
Legend:
Topographical water divide.
Water gauge with No.
Snow survey station (with totalizer).
Precipitation totalizer.
0 10 20 30 40 50 km
THE STATE ELECTRICITY AUTHORITY
Hydrologic Survey
Map of the Þjórsá and Hvítá-Ölfusá River Basins Showing Subdivision of Drainage Area among Tributaries and Location of Water Gauges.
B-277 TNR193-B-274 TNR56 FNR. 4331 20.5.59 SRist/PJ

1. INTRODUCTION

The Þjórsá and Hvítá-Ölfusá [1] river basins are located in the southern part of Iceland. Their parallel drainage systems issue from a broad gathering ground encircled by the three ice caps Langjökull, Hofsjökull and Vatnajökull in the central uplands of the country (see Fig 1). The subdivision of the drainage areas between the main tributary rivers, as well as the size of drainage areas above individual water gauges is shown in Table 1.

These two rivers are the largest in Iceland; their mean discharge being 383 kl/s (Þjórsá at Urriðafoss) and 386 kl/s (Ölfusá at Selfoss). Besides, river Þjórsá is the longest river in Iceland, 230 km. In terms of drainage area, however, the Þjórsá and Hvítá-Ölfusá are the second and third, respectively, of Icelandic rivers, with a drainage area of 7530 and 6100 km^2. (The river with the largest drainage area in the country is the Jökulsá á Fjöllum in the north, with 7950 km^2, but that river has an appreciably lower mean discharge than both the Hvítá and the Þjórsá, owing to a much lower precipitation in that part of the country).

From a power standpoint, the Þjórsá and Hvítá are the most important rivers of the country. According to preliminary rough estimates, these two river systems contain between 1/2 and 2/3 of the total economically harnessable water power of Iceland.

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1) The Ölfusá is, hydrologically, the lowest section of river Hvítá only, the name being confined to the section of the river lying below the confluence of river Sog. In the following, the Hvítá-Ölfusá basin will be referred to as the Hvítá basin only.

Þjórsá and Hvítá-Ölfusá Drainage Systems. Size of Drainage Area of Main Rivers and Tributaries and Above Water Gauges.

No.	Water Gauge No.	Names of rivers and lakes	Length km	Location	Length from sea km	Altitude m
1		ÖLFUSÁ	25+160	Mouth	0	0
2		Þorleifslækur	3+20	Confluence w. 1	6	
3		Varmá	9+11	Confluence w. 2	9	
4	46	"		Reykjaf. Hveragerði	17	
5		"		Gufudalur, bridge	19	
6	64	Ölfusá		Selfoss	18	12
7		Sogið	20+33	Confluence w. 6	25	15
8		Lake Álftavatn		Álftavatn	28	15
9	2	Sog		Ljósafoss	39	
10		Lake Úlfljótsvatn		Úlfljótsvatn	40	
11		Sog		below Þingvallavatn	45	103
12		Lake Þingvallavatn		Þingvallavatn		103
13		Öxará	17	Öxarárfoss		
14		Hvítá	110+50	Confluence w. 1	25	15
15	107	"		Árhraun, Hestfjall	47	48
16		Lake Hestvatn		Hestvatn		49
17		Brúará	40	Confluence w. 14	56	50
18	43	"		Dynjandi	67	
19		Hagaós	2+20	below Apavatn	74	
20		Lake Apavatn		Apavatn		59
21		Lake Laugarvatn		Laugarvatn		62
22		Brúará		below Hrútá		
23		"		below Brúarskörð		
24	41	Hvítá		Iða	62	52
25		Stóra-Laxá	90	Confluence w. 14	64	53
26		Stóra-Laxá		below Geldingafell		500
27		Litla-Laxá	37	Confluence w. 25	64	
28		Tungufljót	28+32	Confluence w. 14	69	53
29	68	"		Faxi	79	68
30		"		below Sandvatn	107	
31		Lake Sandvatn		Sandvatn	107	
32		Hvítá		Hvítárdalur	82	

Drainage area km^2							
Main Stream	Tributary Streams First order	Second order	Third order	Part covered by glacier	Lakes km^2	Characteristic	No.
6100				690		L+J+D	1
	115					D+L	2
		95				D+L	3
		55				D+L	4
		47				D+L	5
5760				690		L+J+D	6
	1200					L+S	7
					2,5	S	8
	1050					L+S	9
					2,9	S	10
	1000					L+S	11
					82,6	S	12
		45				D	13
	4500			690		L+J+D	14
	4360			690		L+J+D	15
					6,0	S	16
		707				L+S	17
		670				L+S	18
			278			L+S	19
					13,6	S	20
					2,1	S	21
		215				L	22
		115				L	23
	3540			690		D+L+J	24
		512				D	25
		133				D	26
		105				D	27
		770		270		L+J	28
		720		270		L+J	29
		566		270		J+D	30
					(3,0)	S	31
	2090			420		D+J+S+L	32

No.	Water Gauge No.	Names of rivers and lakes	Length km	Location	Length from sea km	Altitude m
33	58	Hvítá		Brúarhlöð	87	85
34		Fossá	16	Confluence w. 14	89	
35		"		at farm Foss	93	
36		Dalsá	14	Confluence w. 14	89	
37		"		dam at Jaðar	92	
38	87	Hvítá		Gullfoss	95	189
39		Búðará	15	Confluence w. 14		
40		Stangará	15	Confluenca w. 14		
41		Sandá	39	Confluence w. 14	118	249
42		Grjótá	33	Confluence w. 14	125	258
43	101	Hvítá		Ábóti	129	
44		Jökulfall	58	Confluence w. 14	131	419
45	57	Hvítá		Hvítárbrú, bridge	133	420
46		"		below Hvítárvatn	135	421
47		Lake Hvítárvatn		Hvítárvatn	135	421
48		Svartá	36	Hvítárvatn	137	421

Main Stream	Drainage area km² – Tributary Streams – First order	Second order	Third order	Part covered by glacier	Lakes km²	Characteristic	No.
	2075					D+J+S+L	33
		30				D	34
		19				D	35
		31				D	36
		27				D	37
	2000			420		D+J+S+L	38
		65				D	39
		44				D	40
		327				D	41
		90				D	42
	1230			420		D+J+S	43
		380		90		J+D	44
	843			330		S+J	45
	822			330		S+J	46
					28,0	S	47
		133				D	48

No.	Water Gauge No.	Names of rivers and lakes	Length km	Location	Length from sea km	Altitude m
1		ÞJÓRSÁ	230(198+32)	Mouth	0	0
2	6	"		Egilsstaðir	12	8
3	30	"		Urriðafoss, Þjótandi	20	21
4	"	"		Krókur	25	47
5		Kálfá	25	Confluence w. 1	44	61
6		Þjórsá		Búðafoss	48	74
7		"		Stóri-Núpur	55	120
8		Fossá	43	Confluence w. 1.	72	
9		"		Hjálparfoss		
10		"		Reykholt		
11	99	"		Háifoss		
12		Þjórsá		Tröllkonuhlaup		
13		"		Klofaey	88	
14	97	"		below Tungnaá	97	280
15		Tungnaá	129	Confluence w. 1.	97	280
16		Kaldakvísl	109	Confluence w. 15	113	318
17		Sporðkvísl	3	Confluence w. 16		
18		Tjaldkvísl	8	Confluence w. 16		
19	94	Þórisós	8	Ford		
20		Lake Þórisvatn		Þórisvatn		575
21	95	Kaldak.ab.Þórisós		Sauðafell		
22		Tungnaá		Hrauneyjafoss	117	395
23		"		Tungnárkrókur		
24		Útkvísl+Blautakv.		Confluence w. 15		
25		Tungnaá		Bjallavað		
26	96	"		Vatnaöldur		
27		Vatnak.+Snjóöldukv.		Confluence w. 15		
28		Þjórsá ab. Tungnaá		Árskógar	97	280
29		Þjórsá		Dynkur		
30		Dalsá	20+16	Confluence w. 1	127	500
31		"		dam site Öræfahn.		
32		Draugakvísl	16	Lambafell	145	620

Drainage area km^2					Lakes km^2	Characteristic	No.
Main Stream	Tributary Streams			Part covered by glacier			
	First order	Second order	Third order				
7530				1200		D+J+L	1
7220				1200		D+J+L	2
7200				1200		D+J+L	3
7180				1200		D+J+L	4
	85					D	5
6930				1200		D+J+L	6
6880				1200		D+J+L	7
	223					D+L	8
	213					D+L	9
	155					D	10
	125					D	11
6380						D+J+L	12
6360						D+J+L	13
6320						D+J+L	14
	3470			688		L+J+D	15
		1740		460		J+L+D	16
			6			L	17
			38			L	18
			330			L	19
					70	S	20
		1120				J+D+L	21
	1625					L+J+D	22
	1555					L+J+D	23
		93				L	24
	1400					L+J+D	25
	1350					L+J+D	26
		270				L+S	27
2850				512		D+J	28
2615				512		D+J	29
	253					D+S	30
	243					D+S	31
		72				D	32

No.	Water Gauge No.	Names of rivers and lakes	Length km	Location	Length from sea km	Altitude m
33		Miklilækur	14	Confluence w. l.	129	
34		Kisa	17	Confluence w. l.	131	510
35		"		Múli		620
36	100	Þjórsá		Norðlingaalda		
37		Svartá	20	Confluence w. l.		
38		Hnífá	11	Confluence w. l.		
39		Þjórsá		Sóleyjarhöfði	155	580
40		Fjórðungskvísl	28	Confluence w. l	198	690
41		Bergvatnskvísl	32	Confluence w. l	198	690

Drainage area km^2					Lakes km^2	Characteristic	No.
Main Stream	Tributary Streams			Part covered by glacier			
	First order	Second order	Third order				
	40					D	33
	147					D	34
	60					D	35
2060				512		D+J	36
	95					D	37
	100			32		J+D	38
1740				480		J+D	39
	260			28		J+D	40
	227					D	41

2. STREAM TYPES

2.1 Introduction

The rivers of Iceland are of various types. Rivers which run side by side to sea are often quite different. One river may from time to time have tremendous floods while the other will not change its flow, no matter how the weather is. The variability of the ice formations on the rivers is not less pronounced as one river may run quietly even under a thick ice, while in the next neighbourhood the rivers may flow unfrozen all winter long. The basic causes of this variability of the nature of the rivers are the fire and the ice which have formed the country and between which a continuous struggle for power is carried on. The common and general hydrological phenomena in Iceland cannot be explained nor understood fully except by digging deep into the laws of the glaciers on one hand and on the other hand into the nature of ground water movements in the volvanic areas. It is not surprising to find that as time went by the language has formed special names for the different types of rivers. The names are so clear that with just one word - the name of the type - the nature of the river is so fully explained that long definitions are not necessary. In this paper the main points regarding this division are mentioned.

2.2 Bergvatnsá[1)]Streams and Glacial Streams

Since early times, Icelandic streams have been divided into two groups, bergvatnsá streams and glacier streams. This division originates from the people as Sveinn Pálsson, an Icelandic naturalist, points out in his writings from 1792. It is caused by the clay or mud ground by the moving glaciers from their beds which is carried by the flowing water. Glacial streams are easily recognized by the colour. It is brown at the start but gets lighter farther down from the glaciers and sometimes it is even milky when the streams are mixed to some extent with other water. The bergvatnsá streams, on the other hand, are crystalclear, some of them all year around, but others become darkbrown from mud for a few days each year, either from floods or from driftsand.

This division is caused by the climate. When the climate changes, pure glacial streams may become purely bergvatnsá streams. Such change has been taking place in the last few years but only as far as small streams are concerned and mainly in regions where glaciers have at one time reached over mountain ridges and later retreated during the current warm climatic period. In the same manner clear bergvatnsá streams may become coloured by glacial clay when glaciers grow and reach their origin.

2.3 Glacial Streams

A glacial stream is marked by "J" in this paper (from Icelandic Jökull= Glacier). The most typical characteristic of the glacial streams is the brown colour which results from the mud in the water as mentioned above.

Travellers who ride horseback across glacial streams tend to be a little frightened. The water often roars along over a large area and the

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1) From Icelandic: Bergvatn: "rock water" i.e. water issuing from rock fissures, and á = river.

bottom can nowhere be seen through the muddy water. Only well trained travellers are able to avoid the deepest branches and quicksands. The surface current waves indicate where the safest crossings are.

The glacial streams are strongly characteristic of the Icelandic rivers. The greatest rivers are fed by glaciers or some branches from glaciers are mixed with them. Although only a minor part of the water at the mouth of the river originates from glaciers the colour is still that of the glacial streams and therefore it is generally classified as such, although this is only partly true.

In the following the characteristics of the glacial streams will be described as they are before other types of rivers have changed their nature.

The glacial melt-water often swells up like a hot spring or it flows out from under a domelike cave at the margin of the glacier. One of the main characteristics of the glacial streams is that they are constantly changing their course in flat areas which results from the sand and gravel carried by the streams being sedimented. Great amounts of gravel and sand is carried from under the glaciers and these form great sands immediately below the glaciers. These sands are rather flat and shaped like a section of a cone with its vertex at the outflow of water from under the glacier. Receding glaciers in flat areas have in the last few years formed small lagoons at their edges. Although the outlet of water from the glacier is constantly moving from one end of the lagoon to the other the river flows always from the same place out of the lagoon and its course is more stable than it was before.

The flow of the glacial streams varies greatly. It increases in June and is very great in July and August and then it suddenly decreases in September and is very little all through winter. In places where a violent torrent is flowing from under a glacier on a hot summer day there may be just an insignificant brook or even no water at all in late winter.

Daily fluctuations are also significant for the glacial streams. When the sun is shining brightly in summer they are most voluminous at the glacier edge at 2-3 p.m. while the smallest flow is in the morning shortly after sunrise. The annual run-off is great in comparison with the drainage area and the volume of mud carried is also very great.

The temperature of the water is close to 0°C at the edge of the glacier all the year round. The water temperature is easily affected by the air temperature since the bed of glacial streams is generally distributed over a large area. Porous ice formation will be seen along the banks after one night of freezing. The water level rises on account of under-water-ice formations at the bottom and the rivers freeze as soon as the winter begins to set in. At the outlet from the glaciers, however, the water often does not freeze or the ice is very thin and unsafe.

One phenomenon of the glacial streams which has caused the greatest terror in Iceland and made them most famous in foreign contries is the so-called "jökulhlaup", the violent outbursts of water at the margin of a glacier. These originate mainly from two causes. Firstly, a glacier moving down a main valley past the mouth of a tributary valley prevents all flow of water from the tributary valley thus forming a lake. At last when the water level has reached a certain height the water breaks its way through under the glacier.

Secondly, water accumulates in volcanic areas under the glacier. On the surface everything is covered with snow but sometimes a depression is formed in the glacier surface. In those places volcanic eruptions are accompanied by "jökulhlaups" and besides, "jökulhlaups" occur at regular intervals without there being any visible volcanic activity. These last "jökulhlaups" are similar in nature to the "jökulhlaups" of the first type.

The flow of water in "jökulhlaup" may be from a few dozen cubic meters per second up to tens of thousands of cubic meters per second, i.e. of the same order of magnitude as the largest rivers of the world and the total volume of the water discharged may be a few cubic kilometers. The volume of sediment carried by the "jökulhlaups" is so tremendous that in the largest "jökulhlaups" of the second group as classified above the coastline is pushed considerably out into the ocean in only a few hours. The "jökulhlaups" may occur at any time of the year.

2.4 Division of the Bergvatnsá Streams into Dragá and Lindá Streams

This division, which was initiated by an Icelandic geologist Mr. Guðmundur Kjartansson, is based on geological conditions and cannot be explained or understood fully except by studying the geology of the country. Therefore, a brief account will be given of the main geological formation in Iceland and their effect on the hydrology in their respective areas.

The bedrock of Iceland may be divided into two main groups, Basalt Formation and the "Móberg" Formation, each formation being named after the most common type or rocks. The area of Iceland is about 103 000 km^2, and each of these two formations covers approximately one half of the total area.

The Basalt Formation dates from the Tertiary Period and consists mostly of basaltic lava beds. In the Basalt Formation areas the landscape is characterized by U-shaped valleys eroded by glaciers during the Glacial Period.

The mountains are made up of regular lava beds which in general are slightly inclined towards the centre of the country. Between those, thin layers of lignite are found in a few places and also distinct remnants of plants have been found in thin layers of clay. The oldest remnants of plants are believed to originate from the Eocene period and their age therefore around 60 million years.

The bedrock of the Basalt formation is comparatively watertight. However, insignificant quags are frequently encountered between layers on mountain slopes. In mountain areas and on hills the bedrock is generally bare or almost bare. The flowing water washes loose materials down into the valleys or to the ocean. The vegetation does not store up much water since no forests are anywhere to speak of. Natural water reservoirs are mainly found in the heads of valleys where landslides have formed dams across the valleys. Rivers of the Basalt Formation areas are for the most part made up of accumulation of small brooks from ravines (drag in Icelandic) and valleys and vary greatly with the weather. These rivers are the so-called dragá rivers.

The "Móberg" Formation is younger than the basaltic formation and mostly of Quaternary origin. It contains large proportions of loose volcanic material which as time went by has hardened into so-called palagonite rock. This formation also contains hardened sediments such as moraine which also is called "móberg" (in wider sense), since it is in many respects very similar to the palagonite rock.

The older parts of the "Móberg" formation area, e.g. a large part of the Hvítá and Þjórsá drainage areas are to a large extent made up of continuous basaltic layers, which originally have been lava flows, with thick layers of sediments of various kinds in between. In these older areas of the "Móberg" Formation the bedrock is relatively watertight like that of the Basalt Formation and streams are of similar nature, i.e. of the dragá type.

The same is not true for a few large areas which constitute the youngest parts of the "Móberg" Formation. One of these is in the north and extends from Melrakkaslétta south across Ódáðahraun to Vatnajökull. In the southern part there are two such areas, one extends southwest from Vatnajökull to Mýrdalur, Eyjafjöll and Hekla and the other from Langjökull out to the Reykjanes peninsula. In these areas almost all mountains are built up of palagonite rocks through which water penetrates easily. Volcanic activity has been continuous up to the present time and level ground between the mountains is frequently covered with lava fields. These lava fields are leaky and swallow almost without exception all water which then flows subterraneously in some cases even for several dozen kilometers. When the substratum on which the lavafield rest is watertight the water reappears at the lowest points along the edges. The flow of such springs (Icelandic: lind) is stable all the year round and the rivers they form are called lindá rivers.

In a few mountains, such as Hekla, the water may fall subterraneously for about 1000 meters, but as a rule the water flows back up to the surface without much loss in potential energy. On the Reykjanes peninsula watertight strata are probably not to be found above sea level, since there is hardly any surface water flowing in the coastal areas between Þorlákshöfn to Hafnarfjörður, i.e. an area of 1330 km^2, and there is probably lost directly to the ocean at least as much water as there is in the river Sog. In the same manner all flow of water is subterraneous in an area of almost 370 km^2 on Melrakkaslétta and also in a few areas in Kelduhverfi and Snæfellsnes.

In the preceding pages some of the main points of Iceland's geological history have been discussed. From these it will be evident that there must be a great difference in the nature of the rivers on the two very different areas from the standpoint of water permeability.

2.5 Dragá Streams

A dragá stream, here marked by "D" is a stream which has no distinct origin, but is made up of contributions from a number of small brooks in areas where only a thin layer of soil covers a watertight bedrock.

The dragá streams are therefore found in the areas of the Basalt Formation and in the older and more watertight areas of the "Móberg" Formation. Their discharge is very much dependent on the weather, it increases when it is raining and then decreases almost immediately as it stops raining. In the same manner the water temperature responds quickly to variations in air temperature, so that the water is warm in summer and cold in winter. Ice is quickly formed in the water as the air temperature goes below 0°C. Usually some underwater ice swells up at the bottom before the rivers freeze at the surface. The water swells up but will not cause any real flood since the riverbed is so large that the ice is seldom lifted above the highest flood level. The water breaks forth under the ice, the water level sinks and the ice follows the water level and is also lowered. The discharge is small when it is freezing, and the river becomes like a small brook in long periods of freezing. As thaw sets in, the rivers grow all of a sudden and burst open the ice cover with a great tumult. The great floods of the dragá rivers carry great volumes of sediment, but when they are not flooding the water is crystal clear. They cut out deep canyons where they run down steep slopes, but build up gravel banks where they ramify over flat areas, and there they frequently change their course when they are flooding.

2.6 Lindá Streams

A lindá stream, here marked by "L" is not most respects entirely different from the dragá stream. The lindá streams have a distinct origin, often gushing springs in which case the discharge reaches its full volume not far from the headspring. The water usually has come a long way through subterraneous channels. The flow is very even all year round and unaffected by the whims of the weather so that even seasonal variations are smoothed out. The lindá streams are mainly found in the palagonite areas. A few lindá streams, however, are found in the basalt areas, where landslides have dammed up the heads of valleys and thus caused subterraneous flow. Aside from the flow being constant the water temperature is the same both winter and summer. Such headwaters are in Icelandic named "kaldavermsl". The temperature of most springs ranges from 3° to 5°C, depending on the soil temperature of the drainage area.

Lindá rivers do not freeze near the head spring even in the most severe frost. When ice is formed on the rivers farther down it stays there only for a short time. As soon as the frost diminishes they start breaking off the ice and usually all ice has disappeared before the air temperature has reached above 0°C. However, if it happened that underwater ice reduces the velocity of the water and effects the water level to rise, the rivers usually flow out of their beds and may cause damage since the water is quickly raised above the highest flood level.

The lindá rivers do not make their beds very wide since the sediment carried is usually little and mostly consisting of driftsand, but in the driftsand areas the rivers are generally of this type.

3. CLIMATE AND PRECIPITATION

3.1 General

The climate in Iceland is a rainy island climate, the summers are rather cool and the winters warm. Continental climate is hardly anywhere to speak of although the difference between the weather in the outermost coastal regions and in the central mountain regions is quite pronounced. The depression zones which originate from the east coast of America move north across the Atlantic in the same direction as the Gulf Stream and north over to Iceland and bring great volumes of humid and warm air over the country. But the Polar Sea and Greenland, one of the earth´s main sources of cold air, are not far away and therefore the weather depends on which dominate, the warm southern or the cool northern wind. Mr. Jon Eythorsson, meteorologist, has written as follows about the changeability of the weather.

"The weather and climate of Iceland are mostly determined by the "Great Powers" of cold and warm air to north and south. The weather is therefore very changeable and the monthly averages may fluctuate between wide extremes. In Reykjavik the average temperature of January 1918 war -8.8°C against +3.1°C in 1947. In Stykkishólmur the average temperature of March 1881 was -13.3°C as compared with +5.5°C in 1929.

The seasonal fluctuations of temperature depend obviously on the more less northerly tracks of the depressions in the North Atlantic. In some winters most of the depressions crossing the North Atlantic have a marked tendency to curve north or northwestward off the south coast of Iceland and to become stationary or very slow moving over the Greenland Sea, between Iceland and Greenland. In other years the depressions pass more frequently south of Iceland, reaching their maximum intensity between Iceland and Scotland, and becoming stationary off the western coast of northern Norway.

In the first case winds will be between southeast and southwest in Iceland, bringing mild weather in the winter months and rainy, cool weather in the summer, especially in the southern districts.

A third, not infrequent situation, is an extensive central low over the North Atlantic, off the Icelandic south coast. This will give prevailing easterly and northeasterly winds in Iceland, usually with mild weather in the southern districts and rather cold weather in the northern.

The fourth type of pressure distribution only occurs quite exceptionally, in winter, but causes on the other hand the most abnormally mild winters inIceland. It is marked by a cold high pressure area over Scandinavia and the British Isles, while depressions in the North Atlantic move north and northwestwards even along the western coast of Greenland".

3.2 Records of Precipitation and Temperature

On the insert map in Fig. 1 are shown 11 meteorological stations dispersed around the coastal districts of Iceland. Monthly normals (30 years´ mean) of precipitation and temperature for these stations are shown in tables 2 and 3. Of these 11 stations, only 2, viz. Hæll and Eyrarbakki are located within the two river basins under discussion here. Most meteorological stations in Iceland are located in the inhabited coastal regions, but are unfortunately completely lacking in the central, uninhabited, mountainous parts of the country. Therefore, very meagre information is available on the precipitation in these regions. Some totalizers have, however, been installed in some parts of the central highlands during the last few years.

The hydrological year in Iceland is counted from September 1st through August 31st the following year. Water reserves which are in the form of snow at the end of the calendar year and which vary greatly from one year to another have the effect that flow reports and precipitation reports for the calendar year are not comparable. In September the melting of snow in the mountain areas is as a rule very little and snow accumulation starts again. On the main glaciers there are no sharp time boundaries between melting and accumulation, there is always some melting in the middle of summer and usually some snowing in every month of the year.

The tables 2 and 3 start with the month of September for comparison with the hydrological year.

3.3 Snow Survey

As there are no meteorological stations in the central highlands, very little information is available on snow deposits in these regions. It may, however, be concluded that in general, winter precipitation occurs mostly in the form of snow above elevation ab. 500 m. In the last few years the Hydrologic Survey has collected some descriptive information on snow deposits in these areas. Information is also being collected by the Hydrologic Survey, in collaboration with the Iceland Glaciological Society, on the snow accumulation on the Vatnajökull ice cap, but it is still too early to draw any conclusions from these measurements (The results have been printed in "Jökull", a yearly publication of the Iceland Glaciological Society, Vols. 2 (1952); 3 (1953) and 7 (1957)). Two snow survey stations were established last autumn in the upper part of the Þjórsá drainage area (see Fig. 1), each consisting of 20 stakes mounted 20 m apart in two lines, perpendicular to each other and a precipitation totalizer. These stations are intended to give relative results only viz. to establish a correlation between the water content of the snow cover at the station and the discharge from snowmelt as measured at a near-by water gauge. (Only one reading is available from these stations: On April 18 1959, the mean snow depth at one of them was 440 mm, average spec gravity of the snow 0,572 g/cm^3, giving a water content of 252 mm. The precipitation, as measured by the totalizer, for the period Oct. 13, 1958 to April 18, was 500 mm.

TABLE 2

PRECIPITATION IN MILLIMETRES

30 years averages (normals) 1901 - 1930

Stations	S	O	N	D	J	F	M	A	M	J	J	A	Year
Reykjavík	91	90	96	98	103	87	75	61	51	49	51	52	904
Suðureyri	103	118	105	105	99	86	58	44	36	41	45	64	902
Akureyri	39	56	46	57	43	34	36	31	22	24	35	41	465
Grímsstaðir	40	30	30	30	40	30	30	30	20	25	45	60	410
Raufarhöfn	90	80	55	55	40	35	35	45	25	40	65	85	650
Hólar	165	150	185	200	215	105	140	125	115	75	80	110	1665
Fagurhólsmýri	184	165	170	194	189	180	173	130	123	110	104	107	1828
Vík	216	205	197	224	222	199	191	140	136	126	119	119	2093
Vestmannaeyjar	151	157	148	153	177	144	123	105	97	75	85	84	1497
Hæll	115	110	90	95	75	75	75	65	60	65	70	60	955
Eyrarbakki	124	120	114	103	109	85	82	74	74	81	80	77	1123

TABLE 3

TEMPERATURE °C

30 years averages (normals) 1901 - 1930

Stations	S	O	N	D	D	F	M	A	M	J	J	A	Year
Reykjavík	7.8	4.3	1.4	0.0	-0.6	-0.2	0.5	2.6	6.3	9.6	11.3	10.6	4.5
Suðureyri	6.7	3.4	0.8	-0.4	-1.3	-1.2	-0.9	0.5	4.3	8.1	9.9	8.8	3.3
Akureyri	6.8	2.5	-0.5	-1.9	-2.5	-2.0	-1.7	0.8	5.0	9.3	10.9	9.2	3.0
Grímsstaðir	4.2	0.1	-3.6	-4.9	-5.6	-4.9	-4.5	-1.7	2.1	7.1	9.6	7.2	0.5
Raufarhöfn	5.7	2.6	-0.6	-1.2	-2.2	-2.1	-1.9	-0.4	1.9	6.3	8.7	7.6	2.1
Hólar	6.9	3.8	0.9	0.3	0.0	-0.2	0.0	2.3	5.7	9.1	10.5	9.6	4.1
Fagurhólsm.	7.2	4.0	0.9	0.0	-0.5	0.0	0.8	2.8	5.6	8.7	10.2	9.3	4.1
Vík	8.0	4.9	2.3	1.3	0.9	1.2	1.5	3.1	6.2	9.3	11.0	10.5	5.0
Vestmannae.	7.5	4.8	2.4	1.4	1.1	1.3	1.6	3.0	5.7	8.5	10.2	9.6	4.8
Hæll	7.1	3.4	0.3	-0.9	-1.8	-1.2	-0.8	1.4	5.5	9.5	11.4	9.9	3.7
Eyrarbakki	7.4	3.5	0.5	-0.2	-0.8	-0.9	-0.1	2.3	6.3	9.8	11.5	10.4	4.2

4. SEDIMENT AND CHEMICAL ANALYSIS OF RIVER WATER

4.1 Sediment

The glacial rivers in the area carry large quantities of sediment load, consisting of materials eroded from the bed of the glacier.

The amount of the sediment is very variable, increasing rapidly with the discharge. For the same discharge, the sediment appears to be greater when the discharge is increasing than when it is decreasing. For the determination of the annual sediment transport of the river, therefore, it is most important to observe the sediment content during floods, as the sediment transport during low discharge periods is negligible.

The dragá rivers may also carry a substantial amount of sediment load resulting from erosion by the river itself and the surface run-off feeding it. The variation of the sediment with the discharge is similar in this case to that of the glacial streams.

Lindá rivers usually carry very little sediment; only small amount of wind-blown sand and pumice. During volcanic activity in the neighbourhood of such rivers, and for some time afterwards, they may carry a considerable amount of loose volcanic materials.

Results of measurements of the sediment load in the Þjórsá and Hvítá rivers and some of their tributaries are shown in table 4. Samples for sediment determination are taken in places of high water velocity and great turbulence, where the material otherwise carried as bed load may also be assumed to be in suspension.

4.2 Chemical analysis

Table 4 also shows the chemical analysis of water samples taken occasionally from the main and tributary streams of the Þjórsá and Hvítá river basins, and from springs which may have interest for the ground-water hydrology of the area.

TABLE 4

Suspended Sediment and Chemical Analysis in Milligrammes per litre (mg/l) of Various Rivers in the Þjórsá and Hvítá Basins.

Name of River and Location of Sampling	Date of sampling	Q kl/s	Water temp °C	Undissolved solids mg/l	Undissolved solids kg/s	Dissolved solids mg/l	Total solids mg/l	Hardness as $CaCo_3$ mg/l
1	2	3	4	5	6	7	8	9
Þjórsá								
Norðlingaalda	15.04.56	36	0.9	4.8	0.17	58.8	63.6	9.2
	14.07.57	200	8.8	335.2	67.04			
	06.03.58	22	0.5	2.8	0.06	68.4	71.2	15.0
		66	1.7	46.0	3.03			
		35	0.2	2.0	0.07	62.0		16.4
Kaldakvísl								
Sauðafell	03.03.58	14	0.2	31.2	0.44	82.8	114.0	33.0
	14.07.57	41	8.5	1865.0	76.47	104.8	1969.8	27.9
	14.10.58	31	1.0	188.0	5.83			
	17.04.59	18	0.5	5.0	0.09	79.4		33.0
Þórisós	14.04.56	15	1.4	TRACE		61.6		26.6
	18.04.59	18	2.4	4.4	0.08	63.2		28.0
Hávella	17.04.59		3.3	0.0				9.6
Hvanná	03.03.58	2.6	2.5	10.0	0.26	64.2		19.6
Tungnaá								
Bjallar	11.04.56	58	2.0	75.0	4.35			
Tungnaá								
Vatnaöldur	18.07.57	100		251.9	25.19	58.8	310.7	22.1
	23.02.58	42	0.4	55.9	2.35	75.6		25.4
	07.10.58	69	4.2	105.0	7.25	67.6		23.3
Tungnaá								
Hald	12.04.59	140	1.8	48.2	6.75	76.2		29.4
Springs issuing into river Tungnaá at Lindavík	15.03.59		5.3	0.0	0.0	125.4		46.0
	15.03.59		6.2	0.0	0.0	134.8		43.6
Fossá								
Þjórsárdalur	09.03.58	2	0.1	1.2	TRACE	57.0		12.2

Chloride Cl - mg/l	Bicar-bonate (HCO_3) mg/l	Iron Fe mg/l	Silica SiO_2 mg/l	Calcium Ca^{++} mg/l	Sulfate SO_4^{--} mg/l	Carbon-ate CO_3^{--} mg/l	Resistivity at 25°C Ohm cm	pH
10	11	12	13	14	15	16	17	18
4.2	43.3	0.04	15.6	4.3	7.9			7.39
								7.00
4.0	11.0	0.04	18.8	6.0	6.3	18.6	11830	9.03
								7.20
5.0	28.7	0.04	17.2	4.7	7.6	7.8		8.75
4.9	59.8	0.04	17.4	8.0	8.9	3.6	8120	8.32
2.7	47.6	0.72	38.4	15.7	8.1		12300	7.65
								7.63
5.0	65.3	0.04	14.8	8.1	9.9		8030	7.97
5.4	50.0	0.04	9.2	8.3	8.2			7.62
4.2	42.1	0.04			9.4	4.2	9920	8.25
5.7	10.4	0.04			4.8	16.2	11180	9.56
4.2	11.0	0.04	17.2	6.0	6.1	18.0		8.79
								7.30
4.4	36.6	0.04	10.4	6.3	8.6			
5.9	42.7	0.04	18.6	8.6	10.2	3.6	9810	7.79
4.2	33.6	0.04	15.6	7.1	10.5			7.35
5.2	55.5	0.04	14.2	8.0	8.2		9160	7.50
10.2	88.5	0.04	22.6	10.1	14.8		5140	7.80
10.2	91.5	0.04	26.6	9.1	12.7		4980	7.75
7.4	3.1	0.04	15.4	4.4	4.0	16.2	12960	8.05

To be continued

TABLE 4 continued

1	2	3	4	5	6	7	8	9
Þjórsá								
Búðafoss	24.02.56	215	12.4	29.3	6.30	84.0	113.3	
	04.04.56	370		48.1	17.80	81.6	129.7	
	31.05.56	740		251.8	186.33	40.8	292.6	11.0
	22.07.56	545		274.0	149.33			
	22.07.56	545		251.2	136.90			
	24.06.56	610	6.0	173.5	105.84			
	28.10.56	980		117.0	114.66			
	23.09.56	390		230.0	89.70			
	18.12.56	280		18.4	5.15			
	21.03.57	171		48.7	8.33	76.0	124.7	22.0
	20.05.57	475		839.0	398.53	41.6	880.6	17.4
	21.08.56	350		156.0	54.60			
	22.04.56	510		156.3	79.71	40	196.3	12.2
	15.02.58	273	0.2	13.8	3.77	76.4	90.2	26.6
	20.04.58	320		43.1	13.79	66.8	109.9	22.2
	24.05.58	209	6.1	22.0	4.60	72.4	94.4	23.6
	09.07.58	778		254.0	197.61	59.2	313.2	19.6
	30.09.58	530		294.0	155.82	70.8	364.8	18.8
	24.08.58	496		117.0	58.03			
	19.11.58	700		552.0	386.40	64.0	616.0	18.1
	06.02.59	330		102.5	33.83	46.4		15.7
Þjórsá								
Urriðafoss	01.10.49	460		1408	647.68	480	1688	
	15.11.49	295		1200	354.00	492	1692	
	18.11.49	441		1303	574.62	316	1619	
	14.01.50	166		896	148.74	268	1164	
	01.07.50	364		544	198.02	200	744	
	14.07.50	528		440	232.32	140	580	
	19.07.50	600	12.4	388	232.80	284	672	
	29.02.56	233		149	34.72	71	222	
	06.05.56	380		286	108.68			
	29.08.56	241		39	9.40			

10	11	12	13	14	15	16	17	18
			15.6					6.79
			18.4					6.85
4.9	26.8	0.04	8.0	4.0	4.4			6.40
								7.40
								7.20
								7.40
								7.55
								7.01
5.7	38.4	0.04	12.8	10.3	7.6	9.6		7.90
4.2	22.0	0.04	12.0	5.1	3.8	3.6		
								7.05
4.0	26.8	0.04	6.0	2.6	5.6			7.01
6.2	54.3	0.04	17.6	6.3	9.1		9020	7.72
7.2	47.6	0.04	15.4	5.9	8.1			7.20
5.2	47.6	0.04	17.0	5.1	10.0		9570	7.79
4.2	34.8	0.04	16.8	6.3	5.8		14680	7.15
2.7	34.8	0.26	20.0	9.1	8.7			7.10
								7.05
5.2	32.3	0.04	14.8	5.7	7.7		13280	6.92
6.9	24.4	0.04	10.8	5.4	6.7		13950	7.35
			297.0					
			223.0					
			180.0					6.3
			89.0					6.9
			61.0					7.5
								7.1
								7.1
			12.4					6.91
								7.08
								7.7

TABLE 4 continued

1	2	3	4	5	6	7	8	9
Þjórsá								
Urriðafoss (ctnd)	04.04.57	593		97	57.50			
	15.04.57	380		53	20.14			
	19.04.56	345		244	84.18			
Hvítá								
below Hvítárvatn	11.04.58	27	0.3	8.8	0.24	43.2		17.0
Jökulfall								
mouth	11.04.58	4	0.3	10.2	0.04	93.6		32.0
Hvítá								
Gullfoss	01.08.53	116		112.0	12.99			
	23.02.56	71		15.3	1.09	53.6	68.9	
	23.02.56	71		9.2	0.65	49.6	58.8	
	06.05.56	109		29.9	3.26	49.2	79.1	11.8
	09.06.56	99		47.7	4.72			
	09.06.56	125		30.8	3.85			
	22.07.56	240		435.7	104.57			
	30.08.56	67		4.4	0.29			
	31.10.56	205		154.0	31.57			
	23.12.56	106		23.1	2.45			
	09.01.57	83		10.2	0.85			
	14.02.57	73		22.9	1.67			
	24.02.57	76		31.6	2.40			
	23.03.57	57		21.4	1.22	7.32	94.6	18.4
	19.04.57	98		43.5	4.26			
	19.05.57	98		37.9	3.71			
	16.06.57	157		29.6	4.65			
	15.06.57	140		26.7	3.74			
	23.03.58	53		86.1	4.56			
	14.03.58	55		89.2	4.90			
	13.04.58	377		406.4	153.21			
	22.04.58	165		43.0	0.71			
	06.09.58	118		100.0	11.80			
	07.10.58	98		19.5	1.72			
	15.06.58	173		93.4	16.16			
	09.08.58	88		30.6	2.69			
	05.11.58	160		90.0	14.4			

10	11	12	13	14	15	16	17	18
								7.9
								7.61
								7.11
4.4	19.3	0.04	13.6	5.1	5.3		18050	7.10
5.7	47.6	0.04	23.8	8.1	19.8		8020	6.70
			14.8					7.00
			9.6					7.13
4.4	32.9	0.04	14.8	3.7	4.3			6.90
								7.30
								7.20
								6.53
								7.10
								7.05
								7.15
								7.29
								7.36
								7.26
5.9	35.4	0.04	17.2	6.9	5.4	4.8		7.74
								6.96
								7.06
								7.17
								6.72
								6.70
								7.03
								6.93
								7.00
								6.61
								6.65
								6.85

TABLE 4 continued

1	2	3	4	5	6	7	8	9
Tungufljót								
Faxi	27.06.50	48	6.6	236.0	11.33	72.0	308.0	
	29.07.53	51		136.0	6.94			
	25.05.58	34	7.2	19.6	0.67	46.8		14.0
Hrútá								
mouth	16.02.58	7		0.0	0.0	35.2		10.3
Brúará								
Dynjandi	17.02.58	55	0.7	2.0	0.11	54.2		13.4
Sog								
Ljósafoss	17.02.58	100	0.2	1.0	0.10	51.0		16.8
Ölfusá								
Selfoss	18.02.58	263	0.2	5.0	1.32	84.6		31.0

10	11	12	13	14	15	16	17	18
								7,20
4,4	26,2	0,04	17,0	2,9	3,3	17,0	18970	7,55
3,5	22,6	0,04	13,0	3,1	2,8		22850	9,38
6,2	31,7	0,04	20,4	7,1	4,4		14700	7,77
7,2	35,4	0,04	12,2	4,2	4,1		13380	7,65
12,2	50,0	0,04	18,6	4,6	5,3		8250	7,00

Fig. 2

Ice Conditions Usually Prevailing in the Þjórsá and Hvítá River Systems in the Middle of the Winter.

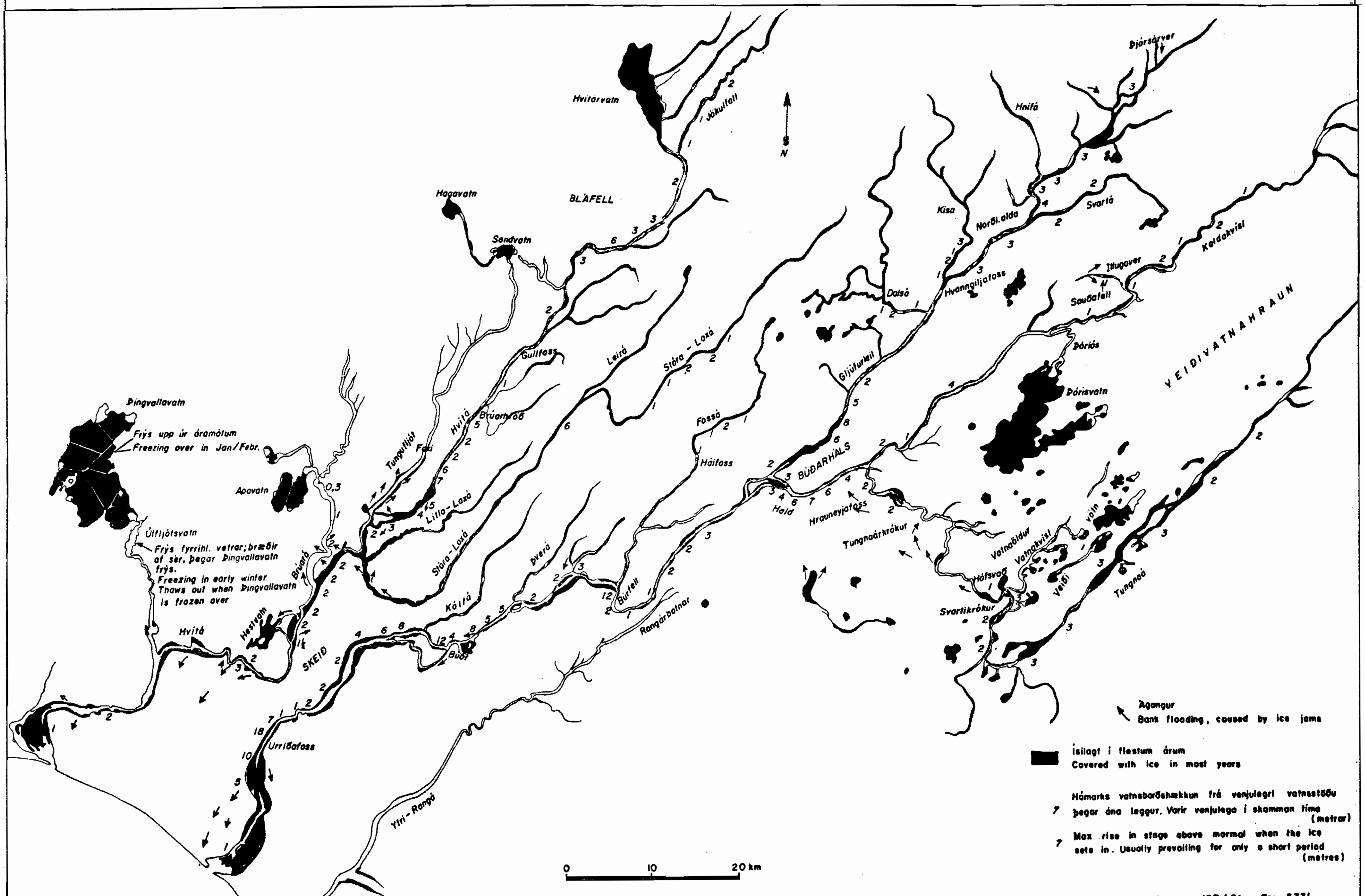
Blue: Water under an ice cover in most years.
Red: Water uncovered in practically all years.
Yellow: Variable ice conditions; covered during hard frosts, otherwise uncovered.

RAFORKUMÁLASTJÓRI
Vatnamælingar

ÍSALÖG HVÍTÁR OG ÞJÓRSÁR UM MIÐJAN VETUR

ICE CONDITION USUALLY PREVAILING IN THE ÞJÓRSÁ AND HVÍTÁ RIVER SYSTEMS IN THE MIDDLE OF THE WINTER

MYND
FIGURE 2-15a



10. Jan. 1961 S. Rist / O.H.

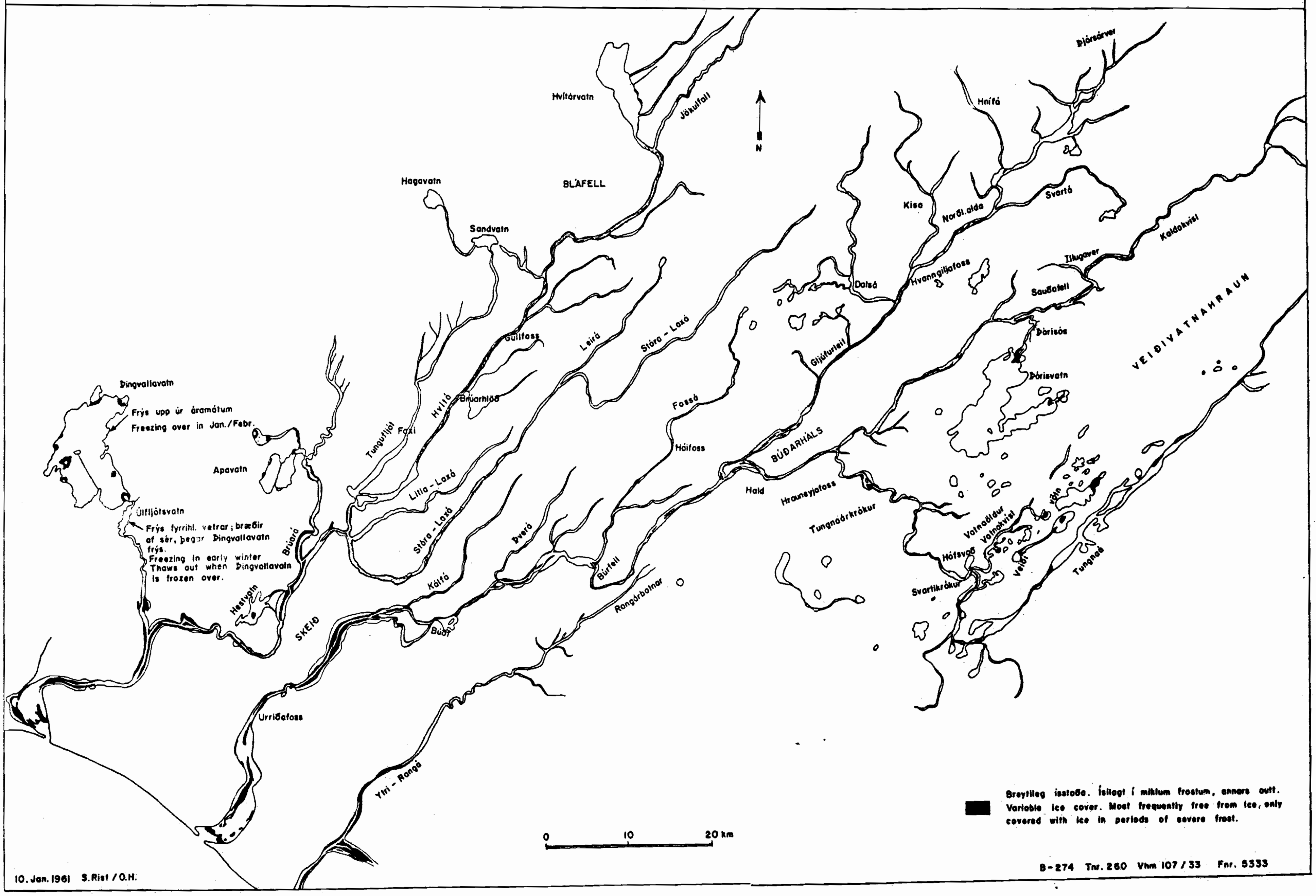
B-274 Tnr. 258 Vhm 107/31 Fnr. 5331

RAFORKUMÁLASTJÓRI
Vatnamælingar

ÍSALÖG HVÍTÁR OG ÞJÓRSÁR UM MIÐJAN VETUR

ICE CONDITION USUALLY PREVAILING IN THE ÞJÓRSÁ AND HVÍTÁ RIVER SYSTEMS IN THE MIDDLE OF THE WINTER

MYND
FIGURE 2–15 b



Breytileg isstaða. Íslagt í miklum frostum, annars autt.
Variable ice cover. Most frequently free from ice, only covered with ice in periods of severe frost.

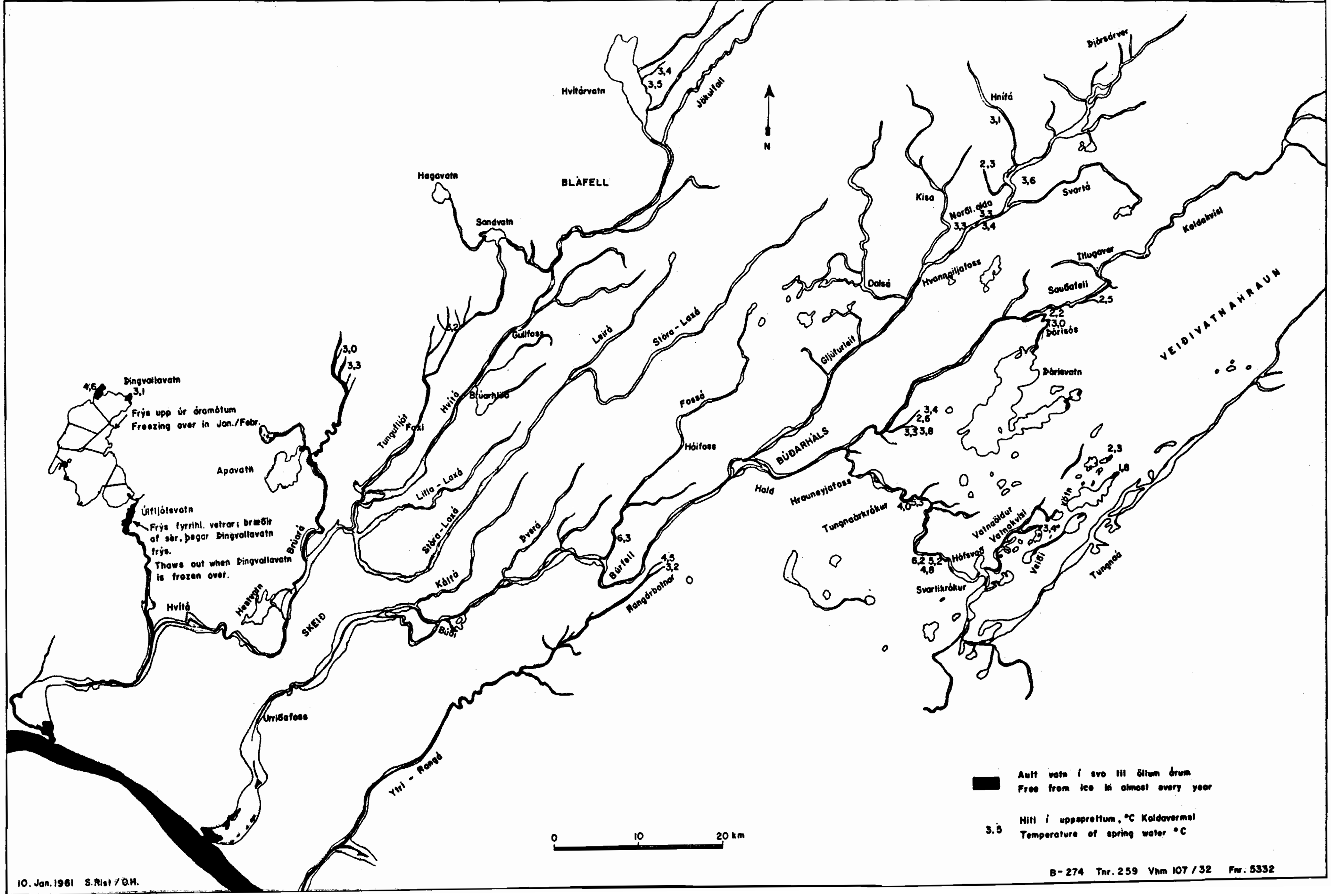
10. Jan. 1961 S. Rist / O.H.

B-274 Tnr. 260 Vhm 107 / 33 Fnr. 5333

RAFORKUMÁLASTJÓRI
Vatnamælingar

ÍSALÖG HVÍTÁR OG ÞJÓRSÁR UM MIÐJAN VETUR
ICE CONDITION USUALLY PREVAILING IN THE ÞJÓRSÁ AND HVÍTÁ RIVER SYSTEMS
IN THE MIDDLE OF THE WINTER

MYND
FIGURE 2-15c



10. Jan. 1961 S. Rist / G.H.

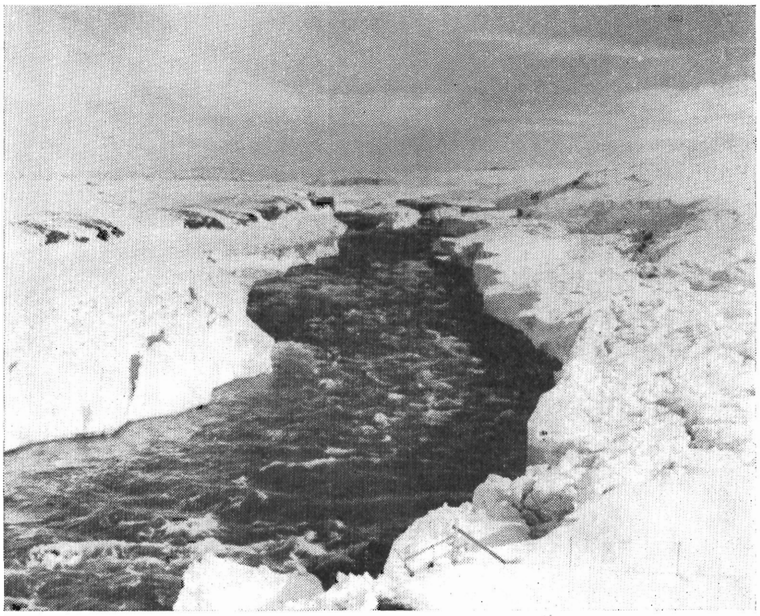
B-274 Tnr. 259 Vhm 107/32 Fnr. 5332

Hrönnin hefur fyllt Þjórsárgljúfrið hjá Urriðafossi og liggur þar eins og skriðjökull.

An ice jam filling the Þjórsá gorge at the Urriðafoss rapids.
Photo in feb. 1957 by S. Rist.

Bærinn Urriðafoss, hrönnin steig 17 m neðan við fossinn febr. 1957.

The ice jam has almost reached the Urriðafoss farm. Max rise in water level 17 m.
Photo in feb. 1957 by S. Rist.

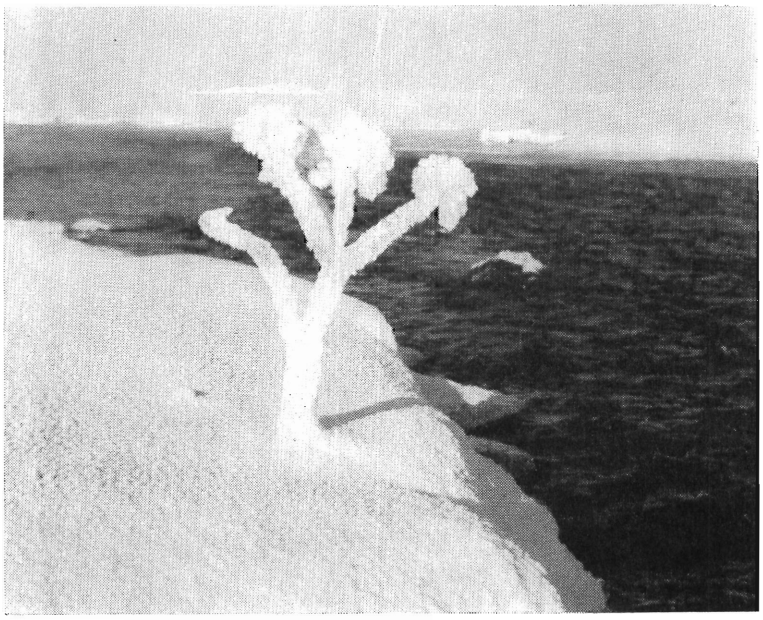


Þjórsá hjá Þjótanda, séð til norðurs.

River Þjórsá at the Urriðafoss rapids, looking north from the bridge. The river has cut itself down through the ice, forming precipitous walls extending 8 m above the water surface.
Photo March 23, 1957 by S. Rist.

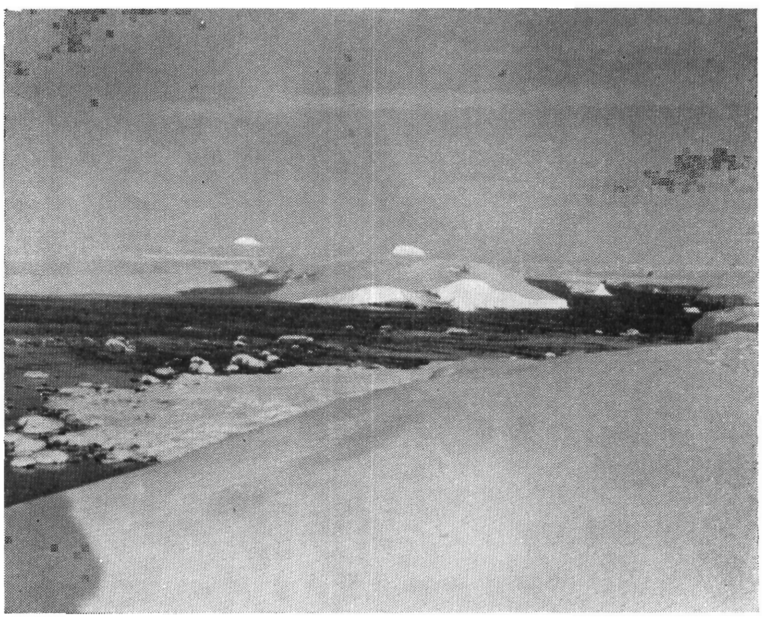
Þórisós. Lindavatnið autt, svo að ís hækkar aldrei vatnsborðið, þótt lofthitinn sé ÷ 20° C eða lægri dag eftir dag.

A water level recorder at river Þórisós. A brook with spring water flows into the river from the right.
Photo Febr. 25, 1958 by S. Rist.



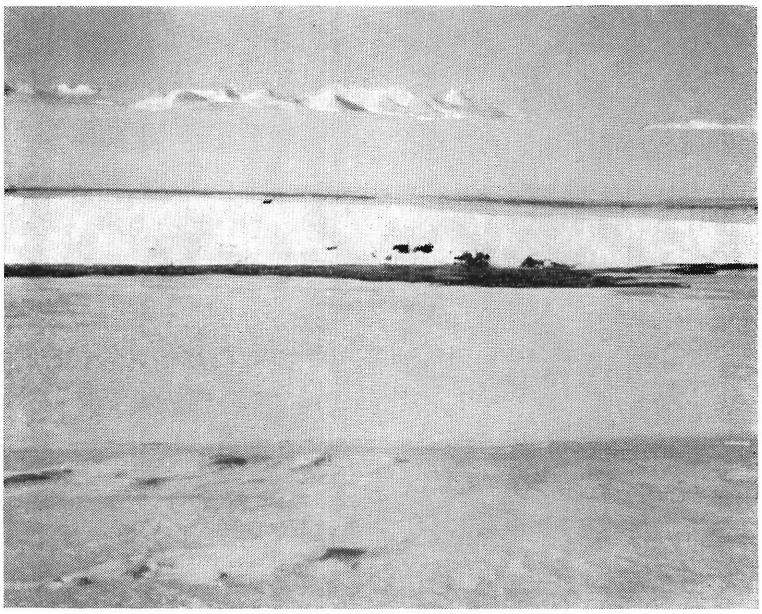
Hrímug hvönn við Þórisós. Lofthiti ÷ 24° C.

River Þórisós, a typical lindá river, with a rime-covered Angelica in the foreground. Air temperature ÷ 24° C. The river never freezes, not even in the most severe frost periods.
Photo Febr. 25, 1958 by S. Rist.



Við Köldukvísl undir Sauðafelli. Kaldakvísl til vinstri ísilögð að mestu, Hvanná til hægri alauð. Síritari settur í Köldukvísl fremst í tungusporðinn. Hágöngur í baksýn.

River Kaldakvísl at Mt. Sauðafell. The main river is to the left, mostly covered with ice. A tributary lindá river, completely ice-free is to the right. A water level recorder has been installed in the tongue between the two rivers.
Photo in Febr. 25, 1958 by S. Rist.

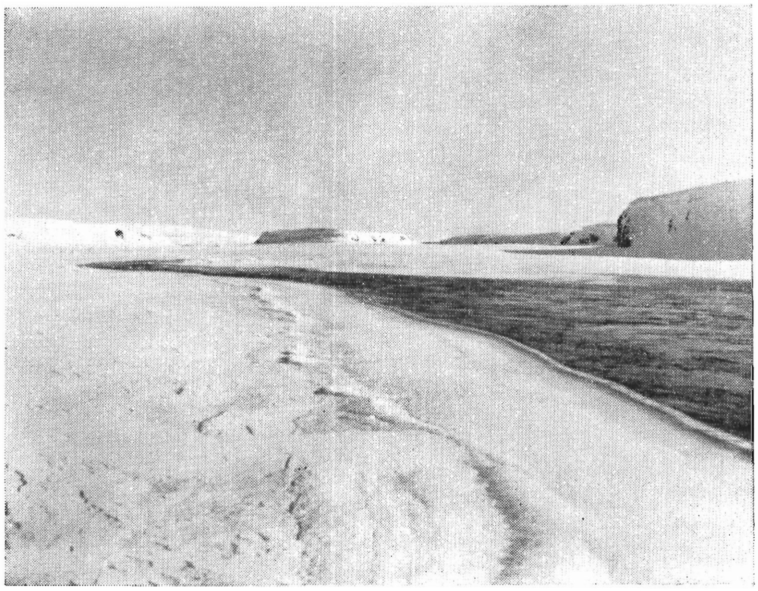


Þjórsá skammt neðan Svartár. Hávella á miðri myndinni. Lindarnar við norðurlandið og úti í farveginn halda ánni þar auðri. Dökka rákin fjær á myndinni eru snjólaus melabörð þakin 5 til 10 cm þykku glæru svelli. Kerlingarfjöll í baksýn.

River Þjórsá below the confluence with river Svartá. Springs issuing into the river at the northern bank keep a channel at the bank ice—free. Temperature of springs + 3,4° C.
Photo in March 6, 1958 by S. Rist.

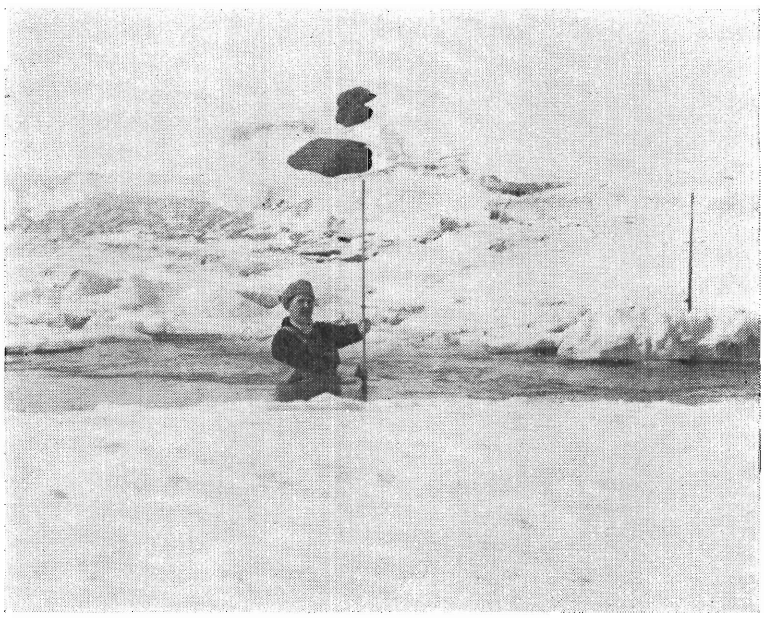
Þjórsárísar kannaðir undan Norðlingaöldu.

River Þjórsá at Norðlingaalda under an ice cover.
Photo in March 1958 by S. Rist.



Úti á Þjórsá undan Norðlingaöldu. Séð upp ána. Vök.

An ice-free channel in the middle of river Þjórsá at Norðlingaalda.
Photo March 7, 1958 by S. Rist.



Rennslismæling.

A stream-flow measurement of river Jökulfal in winter. The river was completely covered with a rough ice cover, which had to be blasted away with dynamite before the discharge could be measured.
Photo in April 1958 by S. Rist.

5. ICE CONDITIONS

5.1 Introduction

In the section on the stream types, a brief description was given of the ice conditions normally occurring in each type. As may be seen from this description, there is a great difference in this respect between the three stream types, viz. the glacial, dragá and lindá streams. The apprecation of this difference is of a paramount importance for the understanding of the ice conditions in Icelandic rivers and of the ice problems that mey arise in connection with their development for electric power production.

The main river in the Þjórsá and Hvítá basins are a mixture of all three types, a fact which entails much more complicated ice conditions than in a river of a single type. The great changeability of the weather in the area has also a great effect in reducing the stability of the ice formations.

Below, a short description will first be given of the general ice conditions in the rivers Þjórsá and Hvítá. The ice problems likely to be encountered at the various potential power sites will then be discussed.

Fig. 2 shows typical ice conditions in the river systems prevailing in the middle of the winter.

5.2 General Ice Conditions

(See also Fig. 2).

5.2.1 Þjórsá river

The grains of the glacial silt in the water act as nuclei for the formations of ice crystals. The water from springs keeps large sections of the river unfrozen, and is at a constant struggle with the cold air, so that the ice cover on the river increases or decreases depending on which of the two dominates. The discharge of the dragá rivers decreases in the first autumn frosts, but the water bursts open the ice cover with a great tumult in periods of thaw.

In the autumn, frazil ice and underwater ice is formed in the glacial rivers (e.g. Þjórsá, Kaldakvísl, Tungnaá) in the vicinity of the glaciers, and also in the uppermost dragá rivers in the area (e.g. Kisa, Dalsá, the upper reaches of Fossá and the streams in Sprengisandur). If the frost lasts for some time, an ice cover is formed on these rivers, but before that, a great amount of sludge has been carried downstream by the current. Although this sludge may reach sections where the river channel is wide and the loss of heat is great, so that the sludge might be expected to freeze into a solid ice cover, this does not happen owing to springs issuing into the river. The amount of sludge in the water may even decrease in places where large quantities of springwater enter the river, although the heat loss from the surface continues as long as there is an open water surface. The result is that an ice cover is formed at each shore, with an open channel in the middle. Thus, a sort of equilibrium may often be reached, generally lasting for long periods in the winter.

As stated above, the ice cover is first formed on the upper reaches of river Þjórsá and its tributaries in the highlands. In the central part of the river course, spring water may prevent the formation of an ice cover. Near the mouth, on the other hand, where the amount of spring-water entering the river is negligible, and where the water velocity is low, a solid ice cover may be formed during periods of great heat loss from the water (frost and wind). Sludge may be collected under the ice, creating an ice barrier and causing a rise in the water level, and a reduction in the velocity, whereby the ice cover proceeds upstream. At the Urriðafoss rapids (See Fig 1) the rise in water level amounts to 15 - 20 m before the river is frozen up. The high water level may prevail for a period of 5 days to 3 weeks, depending on the stability of the weather. This is the max. rise in water level due to ice damming. observed in any river in this country. A similar rise in the water level is ab. 11 m at the Búðafoss waterfall and at the rapids near Mt. Búrfell, farther upstream in river Þjórsá.

5.2.2 Hvítá river

In general, the ice conditions of river Hvítá differ appreciably from those of river Þjórsá, described above. Especially, the various ice phenomena occur to a less extent here.

In the autumn, the Hvítá tributaries in the highlands (e.g. the rivers Jökulfall, Grjótá, Sandá) freeze up, just as the Þjórsá highland tributaries. While freezing, these rivers carry sludge to the main river. This sludge has however, a much less effect here than in the case of river Þjórsá, owing mainly to the following reasons:

a) River Hvítá originates in a great lake, Lake Hvítárvatn, which acts as a storage for the summer heat and keeps the river ice-free during the first days after the winter sets in.
b) The river channel is narrow in the section downstream of the lake, on the eastern and southern sides of Mt. Bláfell, causing a reduction in the heat loss from the river.

Later on, (in Nov. - Dec.) the temperature of Lake Hvítárvatn has fallen down to 0°C, and frazil ice starts forming in the lake and the first section of the river, above the confluence of river Jökulfall. This frazil ice may greatly reduce the outflow from the lake so that a very little amount of sludge is carried downward. At this time, the abovementioned tributaries are covered with a solid ice sheet and no sludge is coming from them. Although some frazil ice is formed in river Hvítá itself, the overall result is that the amount of sludge in it is much less than in river Þjórsá. Further, very little amount of spring water enters the river until at the confluence with river Brúará. As a matter of fact, river Tungufljót is for its main part a lindá river, but its lindá characteristics have largely disappeared in the wide channel in the section from Faxi to river Hvítá. The sludge tends to freeze together and form a solid ice cover along the shores, with an open channel in the middle, all the way downstream from the bridge at the outlet from Lake Hvítárvatn. In periods of hard frost, the ice cover may extend across the river in sections of low water velocity, as for instance above the confluence with river Brúará. In that section, the max. rise in water level, due to ice barriers is usually of the order of 1 metre or less. The max. water level rise throughout the river course occurs in the lower part of the gorge downstream of Brúarhlöð, where a rise of 6 m has been observed. At the water gauge 087 downstream of Gullfoss, the rise amounts to 1,5 m lasting for about a day only.

In the river section lying upstream of the Brúará confluence, the ice cover is steady as long as the frost prevails, because the amount of spring-water entering the river is rather small. During thaw periods, the ice may be broken up in the main channel of the river. A new ice cover in subsequent frost period has not been observed. The reason is presumably that there is only a small heat loss from the relatively narrow open channel in the middle of the river. This channel, therefore, remains open for the most part of the winter.

Downstream of the Brúará confluence, river Hvítá has pronounced lindá characteristics, although it happens that an ice cover is formed on the river where it is wide, as near Selfoss for instance, where a rise in water level of ab. 2 m has been observed.

An ice cover has not been observed on river Tungufljót in the section upstream of the waterfall Faxi, presumably owing to spring water entering the river, and the rise in water level due to ice barriers is negligible (1 to 5 cm). In the section between Faxi and the confluence with river Hvítá, an ice cover may be formed during periods when river Hvítá is freezing up and its water level rising at the confluence, damming up the water of river Tungufljót, so that the lowest section of that river is more a lake than a river during such periods. When the water level of river Hvítá is lowered again, that of river Tungufljót is also lowered, and the river returns to its normal channel. The heat loss is reduced because of the reduction in the area of the water surface, the spring water in the river may gain overhand and melt the ice so that the ice cover over the river itself may completely disappear, even in periods of hard frost.

River Brúará is a typical lindá river. In extreme cases the same thing may occur in its lowest section as described above in the case of river Tungufljót. An ice cover is very rarely formed on the river.

5.3 Ice Problems Likely to be Encountered at Potential Power Sites in the Þjórsá and Hvítá Basins

5.3.1 Þjórsá river system

Urriðafoss

Substantial delays in the construction work as well as damage due to ice jam may be expected during the construction period. The pond above the intercepting dam would be filled by ice, putting the power plant out of operation for a shorter or longer period in each winter.

Skarð

During periods of hard frost, there is usually a narrow open channel in river Þjórsá at the proposed site, carrying large amount of sludge. There are difficulties in constructing a higher dam than 10 - 15 m, which, however, would ensure a considerable amount of pondage. A rough ice cover would be formed on the pond, and only a small amount of sludge would be discharged by the ice spillways in periods of active ice formation (when new ice crystals are being formed in the water). A great amount of ice would be collected in the pond and the ice cover would proceed upstream. During such a situation, an ice dam in river Þjórsá farther umstream is presumably a frequent occurrance. That would entail a fall in the level of the pond and the ice cover on it, but the latter would not rise again by the same amount, when the water level rises. The result would be a substantial reduction in the pondage capacity of the reservoir. Later, the river would flow between precipitous ice walls in the upper part of the reservoir, and immediately upstream of it. (cfr. Photograph from Urriðafoss).

Sultartangi

Great amount of sludge would be carried into the pond during the first frost periods of the winter. It would be at maximum when coming from both rivers, Þjórsá and Tungnaá. Presumably, the greatest part of the sludge would come from the latter as an ice cover would be formed on the Þjórsá. River Tungnaá, on the other hand, which contains considerable amount of spring water, would remain uncovered upstream of the reservoir. During frost period, the river would discharge sludge into the reservoir melting it again when the air temperature rises. An ice jam, similar to that at Urriðafoss has been observed in river Tungnaá in this section, although not reaching the same height. There is some evidence of a water level rise of 7 m during the last 10 - 15 years.

The effect of storage farther upstream on the ice conditions at Sultartangi would presumably be approximately as follows.

As storage in Lake Þórisvatn, operated in such a manner, that the main part of the discharge at the site comes from the reservoir during frost periods would almost eliminate all ice problems at the site.

Even a small amount of storage in river Tungnaá would greatly reduce the flow of sludge into the pond.

A storage in river Þjórsá at Norðlingaalda would decrease the sludge during the first frost periods of the winter, but would later increase it rather than decrease, as it would prevent an ice cover to be formed on the river.

Þjórsárgljúfur

Provided that the dam would be a low intake dam only, the operation of the power plant would be troubled by ice every winter (cfr. the discussion of the ice conditions in the upper reaches of river Þjórsá). During the first frost periods, the amount of sludge in the water would be no less, than in the case of river Tungnaá, and the sludge would generally be in an active state. Further, a complete drying out of river Þjórsá in this place during a period of one or two days, while the river is freezing up farther upstream, is presumably not an all too infrequent event. During the most part of the winter, the pond and the river upstream of it would be under an ice cover, and the water would be in a passive state of ice formation at the site. In periods of sudden thaws, the river may carry great amount of floating ice. A seperate storage dam at Norðlingaalda would have the effect of eliminating the sludge during the first frost periods, and would keep the river uncovered in the section between the storage dam and the Þjórsárgljúfur power site, (20 km) and frequently cause an active ice formation in the river, lasting only, however, for a short period at a time.

Hrauneyjafoss

River Tungnaá is usually uncovered below the automobile ford at the end of the Vatnaöldur ridge, owing to the great amount of spring water flowing into the river from the great lava field on the southwestern river bank. Before an ice cover is formed on the river section lying between Vatnaöldur and the glacier a great amount of sludge is carried down the river and would be collected in an intake pond above Hrauneyjafoss. The sludge may contain sand, which reduces its buoyancy. The volume of the sludge reaches a maximum when a state of inactive ice formation prevails for a long period.

Later in the winter, when an ice cover has been formed on the upper part of river Tungnaá, above Vatnaöldur some sludge may be formed in the river section from there down to the site. This sludge is often in an active state, and would presumably freeze to the intake screens unless special measures, such as electric heating of the screens, are taken. This active ice formation presumably lasts for a short period only at a time.

Tungnaárkrókur

What is said above about Hrauneyjafoss would apply to this site also.

A development of this site would eliminate all ice troubles at Hrauneyjafoss.

Þórisvatn with river Kaldakvísl (and perhaps river Þjórsá also) diverted into the lake

There would no ice troubles at the power plant.

5.3.2 Hvítá river system

Developments of the fall from Lake Hvítárvatn down to the southern slopes of Mt. Bláfell

No ice problems would be encountered.

Gullfoss

Provided that a resonably high (e.g. 25 m or thereabout) intake dam is constructed on the site there would presumably be no ice problems at the power plant. In the middle of the winter, an ice cover would be formed on the pond and would presumably remain there during the coldest months.

Faxi

As mentioned previously, the water level of river Hvítá and the lowest section of river Tungufljót is sometimes raised by ice jamming, which might cause a reduction in head at the plant. Otherwise, there would be no ice problems at this site.

Brúará, Dynjandi

The same thing might happen here as at Faxi, but would presumably last for very short periods only. Otherwise, no ice problems.

Hestvatn

The flow of water in a canal connecting river Hvítá with Lake Hestvatn might be disturbed by ice unless provisions are made in the design of the canal to reduce this possibility.

The rise in the tailwater level of the plant due to ice barriers would be negligible.

Selfoss

Owing to the fact that a low dam only can be constructed at the site, the pond would be relatively small, so that an active state of ice formation may be expected at the intake screens. Some rise is tailwater level (1 - 1,5 m) due to ice barriers might also be encountered. These troubles would presumably not last longer than for a period of one week to ten days in each winter.

6. FLOODS

As mentioned in the section on stream types, the discharge of the glacial and dragá streams may fluctuate between wide limits. Therefore, floods are mostly confined to these two river types, although lindá floods may also occur under special circumstances.

A distinction may be made between 5 types of floods:
(1) Spring floods, caused by melting of snow in the highlands. In the Þjórsá and Hvítá river systems, these floods occur in May or June. They usually last for a few days, with the recession extending over a longer period than in the case of the other flood types. (2) Winter floods, caused by a sudden inflow of warm and humid air masses over Iceland, causing heavy rainfall coinciding with intense snowmelting. The max. discharge of these floods may be similar to that of springfloods, but they rise and fall off more quickly than the former. These floods break up the ice on rivers and carry great amount of floating ice which might be dangerous to structures at or in the rivers, whereas the ice has usually mostly disappeared at the time of spring floods. (3) Floods caused by heavy rainfall alone. They have not reached the same magnitude as the other two flood-types and have a much slower recession than they. Floods of this type may occur at any time of the year.
(4) Floods caused by the bursting of an ice barrier in the river. However, such floods are usually low in the Þjórsá and Hvítá systems.
(5) Jökulhlaups, violent outbursts of water from under a glacier. They originate mainly from two causes: Firstly, a glacier moving down a main valley past the mouth of a tributary valley prevents all flow of water from the tributary valley thus forming a lake. At last when the

water level has reached a certain height the water breaks its way through under the glacier. Secondly, water accumulates in volcanic areas under the glacier. On the surface everything is covered with snow but sometimes a depression is formed in the glacier surface. In those places volcanic eruptions are accompanied by jökulhlaups and besides, jökulhlaups ovvur at regular intervals without there being any visible volcanic activity. These last jökulhlaups are similar in nature to the jökulhlaups of the first type.

However, the present conditions at the outlet from the glacier of rivers in the Þjórsá and Hvítá basins do not indicate that such floods are probable although they may be expected at times of volcanism in the glaciers. One such flood (of the first category) occurred in river Tungufljót on Sept. 16, 1929, and was caused by the bursting of an ice dam at Lake Hagavatn, a lake lying at the margin of the Langjökull ice cap. The flood lasted for about a day, and the volume of water released was estimated at ab. 55 Gl.

In lindá rivers, floods of types (1) and (3) viz spring floods and floods caused by heavy rainfall alone are very little marked, but winter floods (2) may occasionally be observed in such rivers, although they are of a much lover magnitude than the winter floods in glacial or dragá streams. The cause of these lindá winter floods is that the drainage area of lindá streams, which usually is very pervious, may be tighted up by frost and ice in the winter.

The highest daily mean discharges of each water year of record for 6 water gauges in the Þjórsá and Hvítá basins. are given in table 14. However, the hydrograph of some floods, is so sharp that the mean daily discharge may not give an occurate value for the max. discharge. Of the present water gauges in the basins, this applies especially to gauges no. 87 (Hvítá, Gullfoss) and no. 30 (Þjórsá, Urriðafoss). For the time prior to the installation of a water recorder, the flood data are somewhat scanty and as the whole period of record is 7 - 11 years only, no conclusions as to possible frequency of floods of a given magnitude can be drawn yet.

7. STREAM GAUGING

7.1 Location of Water Gauges and Duration of Records

Fig. 1 shows the location of water gauges in the Þjórsá and Hvítá river systems.

Apart from the river Sog, where streamflow records are available since 1939, a systematic hydrologic survey of the area began in 1947. At first it was confined to the inhabited lowlands, but was later extended to the mountain regions, initially by carrying out individual discharge measurements in the highlands, for comparison with the simultaneous flow at the water gauges farther downstream. In the last few years, water level recorders have been installed at all the most important locations throughout the two river basins.

Table 5 shows a list of water gauges in the area, and the duration of records at each gauge.

7.2 Results of Stream Gauging

In the following, the results of stream gauging in the two basins are summarized. Tables 6 - 13 incl. show the monthly averages of discharge and the monthly run-offs at various stream gauging stations for the whole period of record, table 14 shows characteristic discharges at the same stations for each water year of record and tables 15 - 16 incl. an estimate of the discharge at various points in the highlands, based on comparative discharge measurements. Figs. 4 - 20 incl. show weekly averages of discharge and Figs. 21 - 27 flow duration curves. Figs. 28 - 37 show for each water year the amount of storage required to maintain a given uniform discharge throughout the year, and finally, figs. 38 - 45 are cumulative storage curves for the whole period of records showing the amount of storage expressed as percentage of the mean annual run-off required to ensure in any given percentage of years a uniform discharge equivalent to a given percentage of the mean discharge.

The max. observed floods (partly from flood marks) in Þjórsá, Urriðafoss are as follows:

Max. observed floods in Þjórsá, Urriðafoss

Order of size	Approx. max. discharge, kl/s	Type	Date
1	3500 - 4000	Winter flood	March 1930
2	3500	" "	" 1948
3	3300	" "	" 1953
4	3200	Spring flood	June 1949

At Ölfusá, Selfoss, the max. observed flood accurred in March 1948 (winter flood). Its max. discharge was of the order of 3000 kl/s.

For the other water gauges, the values of the highest daily mean discharge given in table 14 give a good indication of the floods in those rivers.

TABLE 5

Water Gauges in the Þjórsá and Hvítá-Ölfusá River Systems

Gauge No.	River	Location	Drainage area km2	Gauge Type	Time of Records
57	Hvítá	Hvítárvatn	843	Stevens Recorder, A-35	Since March 1959
101	"	Áboti	1230	" "	Since March 1959
87	"	Gullfoss	2000	A. Ott. Recorder X	Since July 1949
68	Tungufljót	Faxi	720	Staff gauge	Since August 1951
41	Hvítá	Iða	3540	" "	Since July 1948
43	Brúará	Dynjandi	670	" "	Since August 1948
2	Sog	Ljósafoss	1050	Recorder	Since 1939
64	Ölfusá	Selfoss	5760	SMHI Recorder	Since Sept. 1950
100	Þjórsá	Norðl. alda	2060	Stevens Recorder, A-35	Since April 1959
95	Kaldakvísl	Sauðafell	1120	Stevens Recorder, A-35	Since April 1959
94	Þórisós	Vað	330	Stevens Recorder, A-35	Since Febr. 1958
96	Tungnaá	Vatnaöldur	1350	Stevens Recorder, A-35	Since Nov. 1958
98	"	Hald	3470	Stevens Recorder, A-35	To be installed in 1959
97	Þjórsá	below Tungnaá	6320	Stevens Recorder, A-35	To be installed in 1959
99	Fossá	Háifoss	125	Stevens Recorder, A-35	Since Nov. 1958
30	Þjórsá	Urriðafoss	7200	A. Ott. Recorder X	Since June 1947

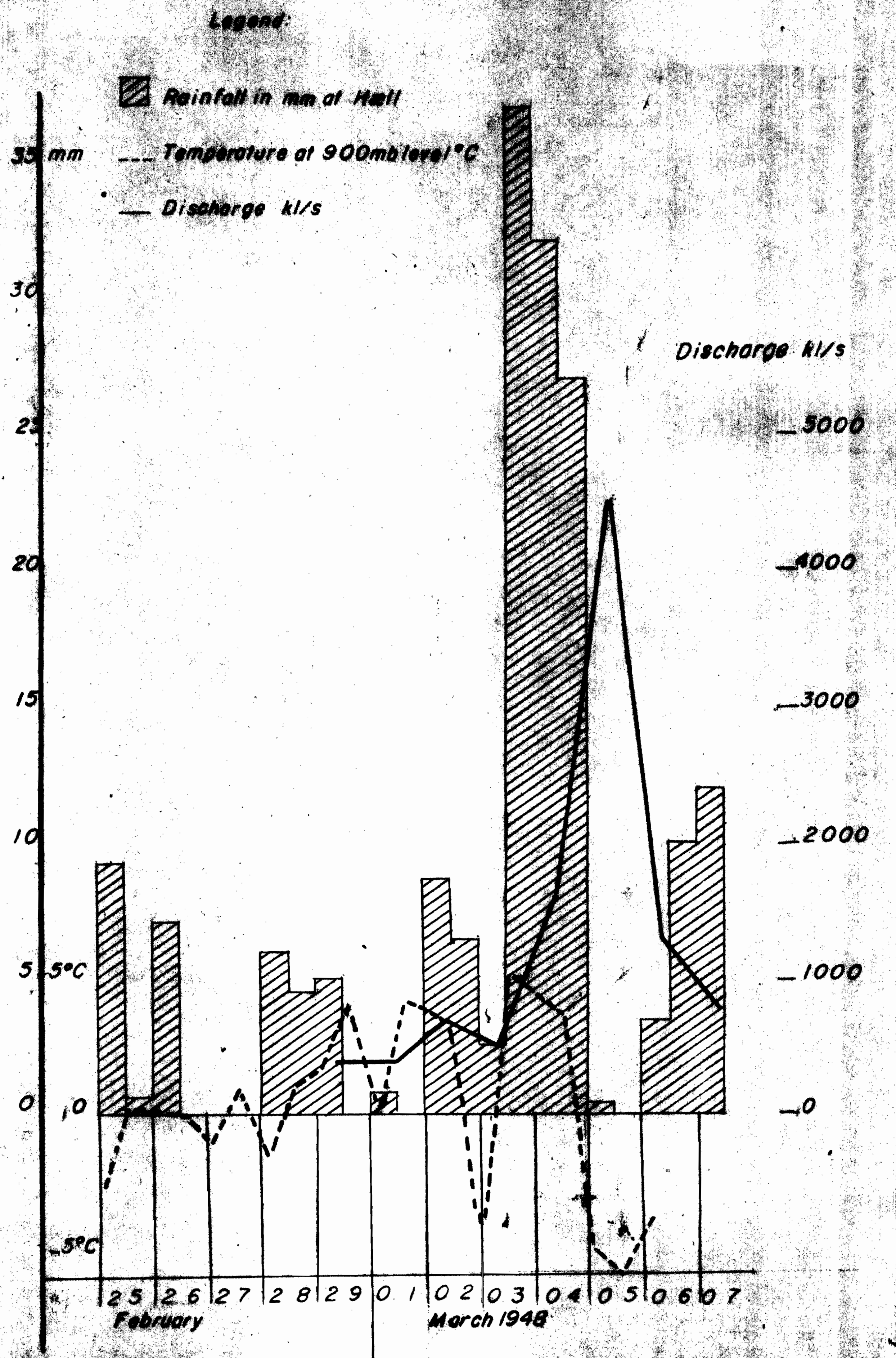
RAFORKUMÁLASTJÓRI

Vatnamælingar

Þjórsá river Urriðafoss

Flood in March '48

2.6.'59 SRst/VS	
TNR 194	
B-277 Vhm 30/21	
FNR 4335	



HVÍTÁ, ÁBÓTI

Hvítá River at Ábóti

Vatnasvið, Drainage Area 1223 km^2; MQ = 72 kl/s; $M\Sigma aQ$ = 2429 Gl; $M\Sigma mQ$ = 202 Gl

Ath: Reiknaðar tölur, 65% af tilsvarandi tölum fyrir Gullfoss (Vhm 87)
Note: Calculated values, taken as 65% of the correspondes values for Hvítá at Gullfoss (Vhm 87)

Sleppið kommunni !
Disregard the decimal point !

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
49.50 #											1,97	2,53	4,50
50.51 #	1,33	1,12	1,13	1,43	88	31	81	91	3,40	2,00	1,90	1,49	17,21
51.52 #	1,37	1,90	1,22	2,16	70	1,81	1,35	1,66	4,10	2,42	2,70	2,40	23,79
52.53 #	1,61	1,59	1,20	1,12	1,39	1,52	6,69	1,92	3,32	3,05	2,79	2,52	28,72
53.54 #	2,29	2,46	2,58	4,22	3,15	1,42	1,92	2,39	3,24	3,23	2,87	2,20	31,98
54.55 #	1,66	1,48	1,39	1,10	1,26	60	1,15	3,77	1,96	2,48	3,52	3,94	24,31
55.56 #	2,65	1,66	1,75	1,33	1,90	2,02	1,78	2,05	2,31	2,26	2,19	1,54	23,44
56.57 #	1,40	1,93	3,28	1,59	1,91	1,33	1,14	1,99	2,63	2,34	2,40	2,26	24,20
57.58 #	1,46	1,97	1,57	1,97	1,28	93	93	2,00	1,21	2,52	2,37	1,64	19,85
Mesta Max.	2,65	2,46	3,28	4,22	3,15	2,02	6,69	3,77	4,10	3,23	3,52	3,94	31,98
Minnsta Min.	1,33	1,12	1,13	1,10	70	60	81	91	1,21	2,00	1,90	1,49	17,21
Meðal Av.	1,72	1,76	1,77	1,87	1,56	1,31	1,97	2,09	2,77	2,53	2,59	2,26	24,19

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

	9	10	11	12	1	2	3	4	5	6	7	8	
49.50 #											73	94	84
50.51 #	51	42	44	53	33	34	30	35	1,27	77	71	56	55
51.52 #	53	71	47	81	26	72	51	64	1,53	93	1,01	90	75
52.53 #	62	59	46	42	52	63	2,50	74	1,24	1,18	1,04	94	91
53.54 #	88	92	99	1,57	1,18	59	71	92	1,21	1,25	1,07	82	1,01
54.55 #	64	55	54	42	47	25	43	1,46	73	96	1,31	1,47	77
55.56 #	1,02	62	68	49	71	81	66	79	86	87	82	58	74
56.57 #	54	72	1,27	59	71	55	42	77	98	90	90	84	77
57.58 #	57	73	60	73	48	38	34	77	45	97	88	61	63
Mesta Max.	1,02	92	1,27	1,57	1,18	81	2,50	1,46	1,53	1,25	1,31	1,47	1,01
Minnsta Min.	51	42	44	42	26	25	30	35	45	77	71	56	55
Meðal Av.	66	66	68	70	58	53	73	81	1,03	98	97	84	77

HVÍTÁ, GULLFOSS

TABLE 7

Hvítá River at Gullfoss

Vatnasvið, Drainage Area 2000 km^2; MQ = 118 kl/s, MΣaQ = 3737 Gl; MΣmQ = 311 Gl

Sleppið kommunni !
Disregard the decimal point!

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year #	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
49,50 #											3,03	3,89	6,92
50,51 #	2,05	1,72	1,74	2,20	1,36	1,25	1,24	1,40	5,23	3,08	2,93	2,29	26,50
51,52 #	2,10	2,93	1,88	.33	1,07	2,78	2,08	2,56	6,31	3,72	4,16	3,69	36,60
52,53 #	2,48	2,45	1,85	172	2,14	2,34	10,29	2,96	5,11	4,70	4,29	3,87	44,19
53,54 #	3,53	3,78	3,97	.49	4,85	2,19	2,95	3,68	4,98	4,97	4,41	3,38	49,20
54,55 #	2,55	2,27	2,14	,70	1,94	93	1,77	5,80	3,02	3,81	5,42	6,06	37,40
55,56 #	4,07	2,55	2,69	.04	2,92	3,11	2,74	3,16	3,55	3,47	3,37	2,42	36,09
56,57 #	2,16	2,97	5,05	,44	2,94	2,04	1,75	3,06	4,05	3,60	3,70	3,48	37,23
57,58 #	2,24	3,03	2,41	3,[illegible]3	1,97	1,43	1,43	3,07	1,86	3,87	3,64	2,53	30,52
#													
#													
#													
Mesta #Max.	4,07	3,78	5,05	6,4[illegible]	4,85	3,11	10,29	5,80	6,31	4,97	5,42	6,06	49,20
Minnsta #Min.	2,05	1,72	1,74	1,7[illegible]	1,07	93	1,24	1,40	1,86	3,08	2,93	2,29	26,50
Meðal #Av.	2,65	2,71	2,72	2,8[illegible]	2,40	2,01	3,03	3,21	4,26	3,90	3,99	3,47	37,22

B Meðalrennsli mánaðar Monthly Averages of Discharge MmQ, kl/s

#	9	10	11	12	1	2	3	4	5	6	7	8	
49,50 #											1,13	1,45	1,29
50,51 #	79	64	67	82	51	52	46	54	1,95	1,19	1,09	86	84
51,52 #	81	1,09	73	1,24	40	1,11	78	99	2,36	1,43	1,55	1,38	1,16
52,53 #	95	91	71	64	80	97	3,84	1,14	1,91	1,81	1,60	1,45	1,40
53,54 #	1,36	1,41	1,53	2,42	1,81	91	1,10	1,42	1,86	1,92	1,65	1,26	1,56
54,55 #	98	85	83	64	73	38	66	2,24	1,13	1,47	2,02	2,26	1,19
55,56 #	1,57	95	1,04	76	1,09	1,24	1,02	1,22	1,33	1,34	1,26	90	1,14
56,57 #	83	1,11	1,95	91	1,10	84	65	1,18	1,51	1,39	1,38	1,30	1,18
57,58 #	87	1,13	93	1,13	74	59	53	1,18	70	1,49	1,36	94	97
Mesta #Max.	1,57	1,41	1,95	2,42	1,81	1,24	3,84	2,24	2,36	1,92	2,02	2,26	1,56
Minnsta #Min.	79	64	67	64	40	38	46	54	70	1,19	1,09	86	84
Meðal #Av.	1,02	1,01	1,05	1,07	90	82	1,13	1,24	1,59	1,51	1,49	1,29	1,18

TABLE 8

TUNGUFLJÓT, FAXI

Tungufljót River at Faxi

Vatnasvið, Drainage Area 720 km^2; MQ = 47 kl/s, MΣaQ = 1473 Gl; MΣmQ = 123 Gl

Sleppið kommunni!
Disregard the decimal point!

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
51,52 #	1,24	1,30	98	1,13	97	1,09	1,06	1,07	1,03	99	1,18	1,37	13,42
52,53 #	1,13	1,02	97	96	1,16	1,10	1,90	97	1,09	1,14	1,33	1,42	14,16
53,54 #	1,34	1,39	1,26	1,71	1,46	1,12	1,19	1,28	1,24	1,29	1,43	1,51	16,23
54,55 #	1,31	1,19	1,28	1,07	1,12	88	1,20	1,29	1,09	1,26	1,68	1,79	15,16
55,56 #	1,73	1,49	1,29	1,11	1,22	1,14	1,27	1,17	1,27	1,23	1,33	1,30	15,55
56,57 #	1,16	1,51	1,64	1,31	1,29	98	1,03	1,12	1,19	1,22	1,32	1,37	15,14
57,58 #	1,29	1,34	1,20	1,21	1,03	92	1,02	1,14	98	94	1,24	1,24	13,54
Mesta Max.	1,73	1,51	1,64	1,71	1,46	1,14	1,90	1,29	1,27	1,29	1,68	1,79	16,23
Minnsta Min.	1,13	1,02	97	96	97	88	1,02	97	98	94	1,18	1,24	13,42
Meðal Av.	1,31	1,32	1,23	1,21	1,18	1,03	1,24	1,15	1,13	1,15	1,36	1,43	14,74

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

	9	10	11	12	1	2	3	4	5	6	7	8	
51,52 #	48	48	38	42	36	44	40	41	38	38	44	51	43
52,53 #	43	38	37	36	43	45	71	38	41	44	50	53	45
53,54 #	52	52	49	64	54	46	45	49	46	50	53	56	51
54,55 #	50	45	49	40	42	36	45	50	41	49	63	67	48
55,56 #	67	56	50	41	46	45	48	45	48	47	49	48	49
56,57 #	45	56	63	49	48	41	39	43	44	47	49	51	48
57,58 #	50	50	46	45	39	38	38	44	37	36	46	46	43
Mesta Max.	67	56	63	64	54	46	71	50	48	50	63	67	51
Minnsta Min.	43	38	37	36	36	36	38	38	37	36	44	46	43
Meðal Av.	51	49	47	45	44	42	47	44	42	44	51	53	47

BRÚARÁ, DYNJANDI

Brúará River at Dynjandi

Vatnasvið, Drainage Area 670 km^2; MQ=66 kl/s; MΣaQ=2069 Gl; MΣmQ=172 Gl

Sleppið kommunni !
Disregard the decimal point !

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
48,49 #	1,45	1,71	2,01	2,13	2,00	1,85	1,83	1,64	1,82	1,85	2,06	1,85	22,19
49,50 #	1,96	2,03	1,73	1,80	2,27	1,55	1,63	1,42	1,65	1,55	1,46	1,45	20,50
50,51 #	1,42	1,46	1,51	1,75	1,73	1,35	1,63	1,50	1,88	1,40	1,41	1,33	18,36
51,52 #	1,29	1,71	1,47	1,78	1,75	1,87	1,88	1,96	1,68	1,47	1,57	1,42	19,85
52,53 #	1,36	1,45	1,45	1,41	1,54	1,76	3,58	1,77	1,78	1,49	1,57	1,45	20,59
53,54 #	1,60	2,08	2,27	3,17	2,45	1,90	2,00	1,99	1,71	1,54	1,55	1,48	23,73
54,55 #	1,42	1,59	1,79	1,57	1,83	1,60	1,62	1,98	1,44	1,41	2,11	2,13	20,50
55,56 #	2,10	1,98	1,81	1,70	2,14	2,02	1,95	1,75	1,80	1,61	1,47	1,39	21,71
56,57 #	1,34	1,84	2,39	2,08	2,18	1,65	1,54	1,76	1,81	1,50	1,45	1,44	20,98
57,58 #	1,34	1,79	1,93	1,93	1,57	1,37	1,55	1,83	1,45	1,32	1,32	1,30	18,70
Mesta Max.	2,10	2,08	2,39	3,17	2,45	2,02	3,58	1,99	1,88	1,85	2,11	2,13	23,73
Minnsta Min.	1,34	1,45	1,45	1,41	1,54	1,35	1,54	1,42	1,44	1,32	1,32	1,30	18,36
Meðal Av.	1,53	1,76	1,84	1,93	1,95	1,69	1,92	1,76	1,70	1,51	1,60	1,52	20,71

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

	9	10	11	12	1	2	3	4	5	6	7	8	
48,49 #	56	64	78	80	75	77	68	63	68	71	77	69	70
49,50 #	76	76	67	67	85	64	61	55	62	60	55	54	65
50,51 #	55	55	58	65	65	56	61	58	70	54	53	50	58
51,52 #	50	64	57	67	66	74	70	76	63	57	59	53	63
52,53 #	52	54	56	53	57	73	1,34	68	66	57	58	54	65
53,54 #	62	77	88	1,18	92	79	75	77	64	59	58	55	75
54,55 #	55	60	69	59	68	66	61	76	54	54	79	79	65
55,56 #	81	74	70	63	80	80	73	67	67	62	55	52	69
56,57 #	52	69	92	78	81	68	57	68	67	58	54	54	66
57,58 #	52	67	75	72	58	57	58	71	54	51	49	48	59
Mesta Max.	81	77	92	1,18	92	80	1,34	77	70	71	79	79	75
Minnsta Min.	50	54	56	53	57	56	57	55	54	51	53	48	58
Meðal Av.	59	56	71	72	73	69	72	68	64	58	60	52	65

HVÍTÁ, HESTFJALL

Hvítá River at Hestfjall

Vatnasvið, Drainage Area 4360 km^2; MQ = 262 kl/s, MΣaQ = 8284 Gl; MΣmQ = 690 Gl

Ath. Reiknaðar tölur eftir niðurstöðum mælinga í Sogi, Ljósafossi (Vhm 2) og Ölfusá, Selfossi (Vhm 64)
Note: Calculated values from the stream-flow data of river Sog at Ljósafoss (Vhm 2) and river Ölfusá at Selfoss (Vhm 64)

Sleppið kommunni ! Disregard the decimal point!

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year #	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
50.51 #	4,51	4,90	4,34	5,19	5,27	3,91	4,15	4,35	8,93	5,28	5,64	5,03	61,52
51,52 #	4,76	7,11	4,64	6,17	9,47	13,41	6,52	7,10	8,98	5,75	6,48	5,99	86,38
52,53 #	4,75	5,02	4,80	4,79	4,89	6,95	18,89	5,96	7,93	6,88	7,04	6,76	84,65
53,54 #	7,26	9,26	8,50	13,11	9,65	6,21	7,35	8,04	7,80	6,79	6,78	6,11	96,85
54,55 #	5,13	5,21	6,28	4,97	6,30	5,53	6,71	10,48	6,08	6,79	10,94	11,85	86,28
55,56 #	9,29	7,26	6,00	5,41	10,40	8,51	7,01	7,67	7,51	7,13	6,12	5,13	87,45
56,57 #	4,98	8,31	12,15	8,04	7,92	5,37	4,75	7,96	8,75	7,03	6,38	6,27	87,91
57,58 #	5,18	7,27	7,58	7,55	4,31	4,44	4,55	7,68	4,79	6,29	6,37	5,18	71,22
Mesta Max.	9,29	9,26	12,15	13,11	10,40	13,41	18,89	10,48	8,98	7,13	10,94	11,85	96,85
Minnsta Min.	4,51	4,90	4,34	4,79	4,31	3,91	4,15	4,35	4,79	5,28	5,64	5,03	61,52
Meðal Av.	5,73	6,79	6,79	6,90	7,28	6,79	7,49	7,41	7,60	6,49	6,97	6,54	82,78

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

#	9	10	11	12	1	2	3	4	5	6	7	8	
50.51 #	1,74	1,83	1,67	1,94	1,97	1,62	1,55	1,68	3,34	2,04	2,11	1,88	1,95
51,52 #	1,84	2,65	1,79	2,31	3,53	5,35	2,44	2,74	3,35	2,22	2,42	2,24	2,74
52,53 #	1,83	1,87	1,85	1,79	1,83	2,87	7,05	2,30	2,96	2,65	2,63	2,52	2,68
53,54 #	2,80	3,46	3,28	4,90	3,60	2,57	2,75	3,10	2,91	2,62	2,53	2,28	3,07
54,55 #	1,98	1,95	2,42	1,85	2,35	2,29	2,50	4,05	2,27	2,62	4,09	4,42	2,73
55,56 #	3,59	2,71	2,32	2,02	3,88	3,40	2,62	2,96	2,81	2,75	2,29	1,91	2,77
56,57 #	1,92	3,10	4,69	3,00	2,96	2,22	1,77	3,07	3,27	2,71	2,38	2,34	2,79
57,58 #	2,00	2,72	2,92	2,82	1,61	1,84	1,70	2,96	1,79	2,43	2,38	1,94	2,26
Mesta #Max.	3,59	3,46	4,69	4,90	3,88	5,35	7,05	4,05	3,35	2,75	4,09	4,42	3,07
Minnsta #Min.	1,74	1,83	1,67	1,79	1,61	1,62	1,55	1,68	1,79	2,04	2,11	1,88	1,95
Meðal #Av.	2,21	2,54	2,62	2,58	2,72	2,77	2,24	2,86	2,84	2,51	2,60	2,44	2,62

SOG, LJÓSAFOSS

Sog River at Ljósafoss

Vatnasvið, Drainage Area 1050 km^2; MQ = 112 kl/s, $M\Sigma aQ$ = 3519 Gl; $M\Sigma mQ$ = 293 Gl

Sleppið kommunni!
Disregard the decimal point

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
39.40 #					3,38	3,13	3,07	3,05	3,41	3,22	3,03	3,09	25,39
40,41 #	2,79	2,97	2,78	3,21	3,17	2,69	2,95	2,68	2,69	2,48	2,65	2,47	33,52
41,42 #	2,63	3,11	2,86	3,33	3,55	3,24	3,32	3,11	3,17	2,81	2,77	2,77	36,67
42,43 #	2,78	2,74	2,76	2,82	2,66	2,40	3,14	3,07	2,98	2,82	2,99	2,65	33,83
43,44 #	2,60	2,94	2,88	3,39	3,30	3,06	3,54	3,23	3,39	3,14	3,01	2,89	37,37
44,45 #	3,02	3,44	3,28	3,17	3,05	2,69	3,49	3,38	3,04	2,79	2,81	2,93	37,08
45,46 #	3,01	3,10	3,28	3,28	3,53	3,14	3,17	3,37	3,23	2,92	2,95	2,77	37,73
46,47 #	2,59	2,95	3,27	3,08	3,54	3,17	3,07	3,06	3,31	2,99	3,09	3,07	37,19
47,48 #	3,21	3,35	2,92	3,04	2,95	2,88	4,19	3,42	3,34	3,09	3,09	2,96	38,45
48,49 #	2,71	2,92	3,02	3,46	3,25	3,07	3,26	2,91	3,04	3,00	3,37	3,02	37,02
49,50 #	3,01	3,15	2,88	2,84	3,26	2,96	2,94	2,70	2,90	2,81	2,70	2,56	34,71
50,51 #	2,42	2,52	2,69	2,48	2,41	2,19	2,35	2,19	2,82	2,44	2,38	2,19	29,06
51,52 #	2,12	2,61	2,37	2,49	2,50	2,35	2,64	2,72	2,91	2,64	2,65	2,45	30,45
52,53 #	2,23	2,37	2,36	2,27	2,41	2,61	3,41	3,06	2,95	2,78	2,82	2,68	31,96
53,54 #	2,73	3,06	3,11	4,06	3,90	3,25	3,42	3,58	3,38	2,98	2,96	2,81	39,25
54,55 #	2,53	2,69	2,82	2,91	2,80	2,32	2,70	2,89	2,69	2,65	2,97	3,17	33,13
55,56 #	3,06	2,95	2,77	2,76	2,80	3,11	3,37	3,14	3,19	2,96	2,84	2,65	35,60
56,57 #	2,49	2,90	3,53	3,69	3,56	2,91	2,89	3,16	3,21	3,05	2,80	2,67	36,87
57,58 #	2,49	2,86	2,80	3,11	2,92	2,46	2,57	2,84	2,75	2,50	2,48	2,27	32,06
Mesta Max.	3,21	3,44	3,53	4,06	3,90	3,25	4,19	3,58	3,41	3,22	3,37	3,17	39,25
Minnsta Min.	2,12	2,37	2,36	2,27	2,41	2,19	2,35	2,19	2,69	2,44	2,38	2,19	29,06
Meðal Av.	2,69	2,92	2,91	3,08	3,09	2,81	3,13	3,03	3,06	2,83	2,85	2,72	35,11

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
39,40 #					1,26	1,25	1,15	1,18	1,27	1,24	1,13	1,15	1,20
40,41 #	1,08	1,11	1,07	1,20	1,18	1,11	1,10	1,03	1,01	96	99	92	1,06
41,42 #	1,01	1,16	1,10	1,24	1,33	1,34	1,24	1,20	1,18	1,09	1,04	1,04	1,16
42,43 #	1,07	1,02	1,07	1,05	99	99	1,17	1,19	1,11	1,09	1,12	99	1,07
43,44 #	1,00	1,10	1,11	1,26	1,23	1,22	1,32	1,25	1,26	1,21	1,12	1,08	1,18
44,45 #	1,17	1,28	1,27	1,18	1,14	1,11	1,30	1,30	1,13	1,08	1,05	1,09	1,18
45,46 #	1,16	1,16	1,26	1,22	1,32	1,30	1,18	1,30	1,21	1,12	1,10	1,04	1,20
46,47 #	1,00	1,10	1,26	1,15	1,32	1,31	1,15	1,18	1,23	1,15	1,15	1,15	1,18
47,48 #	1,24	1,25	1,13	1,14	1,10	1,15	1,57	1,32	1,25	1,19	1,15	1,11	1,22
48,49 #	1,05	1,09	1,16	1,29	1,21	1,27	1,22	1,12	1,13	1,16	1,26	1,13	1,17
49,50 #	1,16	1,18	1,11	1,06	1,22	1,22	1,10	1,04	1,08	1,09	1,01	95	1,10
50,51 #	93	94	1,04	93	90	91	88	84	1,05	94	89	82	92
51,52 #	82	98	91	93	93	94	99	1,05	1,09	1,02	99	91	96
52,53 #	86	89	91	85	90	1,08	1,27	1,18	1,10	1,07	1,05	1,00	1,01
53,54 #	1,05	1,14	1,20	1,52	1,46	1,35	1,28	1,38	1,26	1,15	1,11	1,05	1,24
54,55 #	97	1,01	1,09	1,09	1,04	96	1,01	1,11	1,00	1,02	1,11	1,18	1,05
55,56 #	1,18	1,10	1,07	1,03	1,05	1,24	1,26	1,21	1,19	1,14	1,06	99	1,13
56,57 #	96	1,08	1,36	1,38	1,33	1,20	1,08	1,22	1,20	1,18	1,04	1,00	1,17
57,58 #	96	1,07	1,08	1,16	1,09	1,02	96	1,09	1,03	96	93	85	1,02
Mesta Max.	1,24	1,28	1,36	1,52	1,46	1,35	1,57	1,38	1,27	1,24	1,26	1,18	1,24
Minnsta Min.	82	89	91	85	90	91	88	84	1,00	94	89	82	92
Meðal Av.	1,04	1,09	1,12	1,15	1,15	1,15	1,17	1,17	1,14	1,09	1,07	1,02	1,11

ÖLFUSÁ, SELFOSS

Ölfusá River at Selfoss

Vatnasvið, Drainage Area 5760 km^2; MQ = 386 kl/s; $M\Sigma aQ$ = 12198 Gl; $M\Sigma mQ$ = 1017 Gl

Sleppið kommunni!
Disregard the decimal point!

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
50,51 #	7,33	7,81	7,48	8,09	8,08	6,46	6,89	6,91	12,22	8,12	8,42	7,59	95,41
51,52 #	7,23	10,16	7,40	9,08	12,39	16,15	9,61	10,27	12,37	8,83	9,58	8,85	121,92
52,53 #	7,34	7,79	7,56	7,44	7,70	10,00	22,87	9,54	11,36	10,12	10,34	9,89	121,95
53,54 #	10,45	12,82	12,12	17,85	14,20	10,01	11,34	12,22	11,75	10,27	10,23	9,39	142,66
54,55 #	8,08	8,35	9,58	8,36	9,57	8,24	9,85	13,86	9,22	9,87	14,41	15,55	124,94
55,56 #	12,87	10,70	9,24	8,62	13,76	12,14	10,95	11,33	11,24	10,58	9,43	8,22	129,08
56,57 #	7,89	11,70	16,27	12,35	12,07	8,76	8,12	11,64	12,50	10,60	9,65	9,39	130,93
57,58 #	8,09	10,61	10,85	11,19	7,72	7,31	7,55	10,99	8,01	9,20	9,26	7,84	108,63
Mesta Max.	12,87	12,82	16,27	17,85	14,20	16,15	22,87	13,86	12,50	10,60	14,41	15,55	142,66
Minnsta Min.	7,23	7,79	7,40	7,44	7,70	6,46	6,89	6,91	8,01	8,12	8,42	7,59	95,41
Meðal Av.	8,66	9,99	10,06	10,37	10,69	9,88	10,89	10,85	11,08	9,70	10,17	9,59	121,94

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

	9	10	11	12	1	2	3	4	5	6	7	8	
50,51 #	2,83	2,92	2,88	3,02	3,02	2,67	2,57	2,67	4,56	3,13	3,15	2,83	3,02
51,52 #	2,79	3,79	2,86	3,39	4,63	6,45	3,59	3,96	4,62	3,41	3,58	3,30	3,86
52,53 #	2,83	2,91	2,92	2,78	2,88	4,13	8,54	3,68	4,24	3,90	3,86	3,69	3,86
53,54 #	4,03	4,79	4,68	6,67	5,30	4,14	4,23	4,71	4,39	3,96	3,82	3,51	4,52
54,55 #	3,12	3,12	3,70	3,12	3,57	3,41	3,68	5,35	3,44	3,81	5,38	5,81	3,96
55,56 #	4,96	4,00	3,56	3,22	5,14	4,84	4,09	4,37	4,20	4,08	3,52	3,07	4,09
56,57 #	3,04	4,37	6,28	4,61	4,51	3,62	3,03	4,49	4,67	4,09	3,60	3,51	4,15
57,58 #	3,12	3,96	4,19	4,18	2,88	3,02	2,82	4,24	2,99	3,55	3,46	2,93	3,44
Mesta Max.	4,96	4,79	6,28	6,67	5,30	6,45	8,54	5,35	4,67	4,09	5,38	5,81	4,52
Minnsta Min.	2,79	2,91	2,86	2,78	2,88	2,67	2,57	2,67	2,99	3,13	3,15	2,83	3,02
Meðal Av.	3,34	3,73	3,88	3,87	3,99	4,04	4,07	4,18	4,14	3,74	3,80	3,58	3,86

ÞJÓRSÁ, URRIÐAFOSS

Þjórsá River at Urriðafoss

Vatnasvið, Drainage Area 7200 km^2; MQ = 383 kl/s; $M\Sigma aQ$ = 12072 Gl; $M\Sigma mQ$ = 1006 Gl

Sleppið kommunni!
Disregard the decimal point!

A Mánaðavatn Monthly Run-offs ΣmQ, Gl

Vatnsár Water year	Mánuður Month 9	10	11	12	1	2	3	4	5	6	7	8	Árið The year
4647 #								7,20	17,86	9,69	15,69	18,79	69,24
4748 #	11,65	10,94	7,03	9,07	6,57	7,17	16,11	7,77	12,98	16,18	13,61	11,43	130,50
4849 #	7,76	7,82	7,78	7,83	5,55	9,12	7,22	5,20	6,61	32,89	28,10	12,92	138,81
4950 #	13,34	9,69	7,87	4,93	9,20	7,32	6,66	5,03	19,23	18,62	13,06	14,98	129,92
5051 #	8,76	7,18	7,27	6,95	5,54	4,27	3,41	2,74	14,86	10,54	10,97	9,86	92,33
5152 #	8,59	9,83	5,46	5,77	4,37	7,28	5,64	7,11	18,18	11,95	12,19	11,61	107,99
5253 #	7,46	7,57	5,55	4,90	4,81	6,28	22,71	5,96	14,92	14,39	13,33	13,59	121,49
5354 #	11,83	10,39	8,77	13,62	10,24	5,56	7,69	8,23	18,51	14,20	12,97	11,81	133,81
5455 #	7,96	6,20	6,25	5,28	6,88	5,14	5,23	13,82	12,16	13,76	16,86	17,87	117,41
5556 #	11,19	7,29	6,99	4,77	7,34	8,51	7,76	8,90	14,43	12,88	11,79	8,77	110,62
5657 #	7,90	9,05	14,01	9,16	6,56	3,48	4,52	8,66	18,43	12,56	12,34	12,92	119,60
5758 #	8,22	9,13	7,63	8,30	5,29	6,05	5,53	9,01	6,49	15,86	14,78	10,47	106,75
Mesta Max	13,34	10,94	14,01	13,62	10,24	9,12	22,71	13,82	19,23	32,89	28,10	18,79	138,81
Minnsta Min	7,46	6,20	5,46	4,77	4,37	3,48	3,41	2,74	6,49	9,69	10,97	8,77	92,33
Meðal Av.	9,51	8,64	7,69	7,33	6,58	6,38	8,41	7,49	14,25	15,80	14,55	12,38	119,02

B Meðalrennsli mánaða Monthly Averages of Discharge MmQ, kl/s

	9	10	11	12	1	2	3	4	5	6	7	8	
4647 #								2,78	6,67	3,74	5,86	7,02	5,21
4748 #	4,49	4,08	2,71	3,39	2,45	2,86	6,02	3,00	4,85	6,24	5,08	4,27	4,13
4849 #	2,99	2,92	3,00	2,92	2,07	3,77	2,70	2,01	2,47	12,69	10,49	4,83	4,40
4950 #	5,15	3,62	3,04	1,84	3,44	3,02	2,49	1,94	7,18	7,19	4,88	5,59	4,12
5051 #	3,38	2,68	2,80	2,60	2,07	1,76	1,27	1,06	5,55	4,07	4,10	3,68	2,93
5152 #	3,32	3,67	2,11	2,15	1,63	2,90	2,11	2,74	6,79	4,61	4,55	4,33	3,42
5253 #	2,88	2,83	2,14	1,83	1,80	2,60	8,48	2,30	5,57	5,55	4,98	5,07	3,85
5354 #	4,56	3,88	3,39	5,09	3,82	2,30	2,87	3,18	6,91	5,48	4,84	4,41	4,24
5455 #	3,07	2,32	2,41	1,97	2,57	2,13	1,95	5,33	4,54	5,31	6,30	6,67	3,72
5556 #	4,32	2,72	2,70	1,78	2,74	3,40	2,90	3,43	5,39	4,97	4,40	3,27	3,51
5657 #	3,05	3,38	5,40	3,42	2,45	1,44	1,69	3,34	6,88	4,85	4,61	4,82	3,78
5758 #	3,17	3,41	2,94	3,10	1,97	2,50	2,06	3,47	2,42	6,12	5,52	3,91	3,38
Mesta Max	5,15	4,08	5,40	5,09	3,82	3,77	8,48	5,33	7,18	12,69	10,49	7,02	4,40
Minnsta Min	2,88	2,32	2,11	1,78	1,63	1,44	1,27	1,06	2,42	3,74	4,10	3,27	2,93
Meðal Av.	3,67	3,23	2,97	2,74	2,46	2,61	3,14	2,89	5,32	6,10	5,43	4,62	3,77

Raforkumálastjóri
Vatnamælingar
The State Electricity Authority
Hydrological Survey

TABLE 14

EINKENNISRENNSLI HVERS VATNSÁRS

CHARACTERISTIC RUN-OFFS FOR EACH WATER YEAR OF RECORD

Vhm nr. / Water Gauge No; Vatnsfall / Water-course; Mælistaður / Location; Vatnasvið / Drainage Areas	Vatnsár (1/9 - 31/8) Water year	HaMdQ kl/s	HaMdQ P.u. MQ	MaQ kl/s	MaQ P.u. MQ	Qa50 kl/s	Qa75 kl/s	Qa95 kl/s	LaMdQ kl/s	LaMdQ P.u. MQ	Maq 1/s km²
1	2	3	4	5	6	7	8	9	10	11	12
87	50/51	316,3	2,67	84	0,71	74,0	49,0	34,1	31,9	0,27	42
Hvítá	51/52	578,7	4,89	116	0,98	97,1	61,8	36,0	31,9	0,27	58
Gullfoss	52/53	1150,0	9,71	140	1,18	95,0	74,0	64,8	49,0	0,41	70
2000 km² MQ=118,4 kl/s	53/54	495,0	4,18	156	1,32	136,1	97,1	69,3	48,9	0,41	78
MΣ aQ=3737 Gl/a	54/55	770,1	6,50	119	1,01	91,0	63,9	40,0	30,0	0,25	60
	55/56	180,2	6,84	114	0,96	99,0	84,0	67,0	56,0	0,47	57
	56/57	341,0	2,88	118	1,00	114,0	86,0	62,0	47,0	0,40	59
	57/58	377,0	3,18	97	0,82	90,0	65,0	53,0	44,0	0,37	49
68	51/52	116,0	2,48	43	0,92	40,5	36,7	35,8	35,5	0,76	60
Tungufljót	52/53	173,6	3,72	45	0,96	42,8	37,4	36,1	35,5	0,76	62
Faxi	53/54	111,8	2,39	51	1,09	49,8	47,3	41,6	37,4	0,80	71
720 km² MQ=46,7 kl/s	54/55	125,0	2,68	48	1,02	45,1	40,2	36,1	35,5	0,76	67
MΣ aQ=1473 Gl/a	55/56	96,1	2.06	49	1,05	48,2	45,1	38,8	36,1	0,77	68
	56/57	114,0	2,44	48	1,02	45,7	43,4	37,8	36,4	0,78	67
	57/58	93,5	2,00	43	0,93	40,6	37,80	35,0	33,8	0,72	60
43	48/49	154,9	2,36	70	1,07	66,3	61,9	56,8	51,0	0,77	104
Brúará	49/50	143,9	2,19	65	0,99	61,5	55,6	53,4	50,1	0,76	97
Dynjandi	50/51	129,6	1,98	58	0,88	54,4	51,9	49,5	49,2	0,75	87
670 km² MQ=65,6 kl/s	51/52	139,9	2,13	63	0,96	57,6	54,1	49,2	48,4	0,74	94
MΣ aQ=2069 Gl/a	52/53	193,9	2,96	65	0,99	56,4	52,8	51,9	48,8	0,74	97
	53/54	181,2	2,76	75	1,14	67,8	59,5	55,0	52,5	0,80	112
	54/55	130,0	1,98	65	0,99	59,1	54,7	52,5	52,3	0,78	97
	55/56	118,1	1,80	69	1,05	65,9	59,5	52,2	49,2	0,75	103
	56/57	174,8	2,66	66	1,01	61,5	54,4	51,3	50,1	0,76	98
	57/58	114,6	1,75	59	0,90	55,3	51,0	48,1	41,6	0,63	88

1	2	3	4	5	6	7	8	9	10	11	12
107	50/51	580	2,21	195	0,74	177	155	111	70	0,27	45
Hvítá	51/52	853	3,25	274	1,04	228	193	162	117	0,45	63
Hestfjall	52/53	1519	5,79	268	1,02	213	183	156	106	0,40	61
4360 km^2 MQ=262 kl/s	53/54	996	3,80	307	1,17	272	240	206	174	0,66	70
MΣ aQ=8284 Gl/a	54/55	1018	3,88	273	1,04	238	179	147	135	0,51	63
	55/56	618	2,36	277	1,06	257	213	178	107	0,41	64
	56/57	733	2,79	279	1,06	245	224	166	153	0,58	64
	57/58	690	2,63	226	0,86	211	178	149	136	0,52	52
2	40/41	130,4	1,17	106	0,95	105,9	99,5	91,7	83,1	0,74	101
Sog	41/42	150,2	1,35	116	1,04	117,1	107,1	99,1	85,9	0,77	110
Ljósafoss	42/43	127,8	1,15	107	0,96	107,4	102,0	95,4	84,6	0,76	102
1050 km^2 MQ=111,6 kl/s	43/44	145,9	1,31	118	1,05	119,9	109,1	99,9	91,8	0,82	112
MΣ aQ=3519 Gl/a	44/45	144,8	1,30	118	1,05	115,9	109,5	102,2	98,3	0,88	112
	45/46	142,6	1,28	120	1,08	118,6	112,3	104,4	97,7	0,88	114
	46/47	161,5	1,45	118	1,05	116,2	111,6	100,5	96,9	0,87	112
	47/48	174,5	1,56	122	1,09	119,6	112,4	105,9	102,4	0,92	116
	48/49	142,1	1,27	117	1,04	116,2	110,4	104,3	95,7	0,86	111
	49/50	140,4	1,26	110	0,99	109,7	103,4	96,2	89,7	0,80	105
	50/51	122,3	1,10	92	0,82	91,2	87,4	80,4	78,4	0,70	88
	51/52	116,1	1,04	96	0,86	96,8	90,4	82,2	78,8	0,71	91
	52/53	144,9	1,30	101	0,91	99,8	88,4	83,6	81,4	0,73	96
	53/54	167,1	1,50	124	1,11	122,8	109,8	104,4	91,3	0,82	118
	54/55	128,5	1,15	105	0,94	103,8	99,3	92,9	85,8	0,77	100
	55/56	133,0	1,19	113	1,01	111,9	105,2	99,0	95,4	0,85	108
	56/57	152,7	1,37	117	1,04	117,1	104,7	95,9	93,6	0,84	111
	57/58	120,3	1,08	102	0,91	100,1	95,7	85,3	82,6	0,74	97
64	50/51	706	1,83	302	0,78	285	257	248	164	0,42	52
Ölfusá	51/52	967	2,50	386	1,00	346	302	163	213	0,55	67
Selfoss	52/53	1684	4,36	386	1,00	333	289	257	205	0,53	67
5760 km^2 MQ=386 kl/s	53/54	1188	3,07	452	1,17	416	372	336	302	0,78	78
MΣ aQ=12198 Gl/a	54/55	1159	3,00	296	1,02	364	295	263	254	0,66	69
	55/56	732	1,89	409	1,06	393	333	295	230	0,60	71
	56/57	890	2,30	415	1,07	382	350	292	263	0,68	72
	57/58	923	2,12	344	0,89	329	292	266	263	0,68	60

1	2	3	4	5	6	7	8	9	10	11	12
30	47/48	2781	7,26	413	1,08	375	273	201	135	0,35	57
Þjórsá	48/49	2917	7,62	440	1,15	286	221	166	162	0,42	61
Urriðafoss	49/50	1687	4,40	412	1,08	364	241	156	135	0,35	57
7200 km^2 MQ = 382,5 kl/s	50/51	839	2,19	293	0,77	250	184	108	84	0,22	41
M aQ = 12072 Gl/a	51/52	1584	4,14	342	0,89	311	205	166	108	0,28	47
	52/53	3184	8,31	385	1,01	286	213	135	84	0,22	53
	53/54	1403	3,66	424	1,11	392	301	209	108	0,28	59
	54/55	1584	4,14	372	0,97	273	221	172	121	0,32	52
	55/56	1236	3,23	351	0,92	336	241	153	121	0,32	49
	56/57	1945	5,08	378	0,99	364	255	135	95	0,25	52
	57/58	950	2,48	338	0,88	282	229	180	121	0,32	47

TABLE 15

Estimated Average Values of Monthly Averages of Discharge at Different Locations in the Þjórsá River System, Based on Streamflow Records at Urriðafoss and Comparative Discharge Measurements in the Highlands.

Unit: kilolitres per second (kl/s = m 3/s)

River and Location \ Month	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Year
Þjórsá, Urriðafoss	372	324	294	270	250	263	327	285	556	615	544	463	380
Þjórsá, Skarð	360	310	280	260	240	253	300	260	530	605	534	453	365
Fossá, Háifoss	5	9	7	5	4	4	8	12	15	9	7	5	7,5
Þjórsá, Sultartangi	336	273	247	221	213	226	254	245	475	579	510	430	334
Þjórsá + Fossá, Hjálp	351	290	262	245	230	281	271	510	598	527	446	446	355
Þjórsá, Þjórsárgljúfur	140	75	75	73	73	90	90	59	210	245	250	213	132
Þjórsá, Norðlingaalda	110	60	60	50	45	60	60	40	130	190	200	170	99
Tungnaá, Hald	185	187	161	140	127	126	144	174	239	304	244	209	187
Tungnaá, Hrauneyjafoss	110	110	90	80	75	75	90	100	120	170	140	120	107
Tungnaá, Tungnaárkrókur	101	101	82	72	67	67	82	91	107	159	131	111	98
Tungnaá, Vatnaöldur	85	85	65	55	55	55	65	75	85	130	110	90	80
Kaldakvísl, Sauðafell	35	35	30	25	20	20	22	23	35	55	50	50	33
Þórisós, Vað	13	14	14	13	13	12	12	13	16	17	17	14	14
Kaldakvísl + Þórisós	48	49	44	38	33	32	34	36	51	72	67	64	47

TABLE 16

Estimated Median Values of Monthly Averages of Discharge at Different Loctations in the Þjórsá River System, Based on Streamflow Records at Urriðafoss and Comparative Discharge Measurements in the Highlands.

Unit: kilolitre per second (kl/s = m 3/s)

River and Location \ Month	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
Þjórsá, Urriðafoss	330	325	275	237	230	274	260	288	555	542	486	453	
Þjórsá, Skarð	320	270	245	220	200	220	225	230	470	520	460	405	
Fossá, Háifoss	4,5	8	6	4	3,5	3	7	10	13	8	6	4,5	
Þjórsá, Sultartangi	285	230	210	185	180	180	185	195	405	495	455	370	
Þjórsá + Fossá, Hjálp	305	250	225	210	195	210	205	225	450	515	455	395	
Þjórsá, Þjórsárgljúfur	120	65	65	60	60	65	65	55	180	210	215	180	
Þjórsá, Norðlingaalda	90	55	55	45	40	55	55	35	115	160	170	145	
Tungnaá, Hald	160	160	140	120	110	110	110	130	210	275	215	180	
Tungnaá, Hrauneyjafoss	90	90	75	65	60	60	65	75	90	125	120	105	
Tungnaá, Tungnaárkrókur	85	85	70	60	55	55	60	70	80	115	110	95	
Tungnaá, Vatnaöldur	70	70	55	50	50	45	50	60	65	105	90	80	
Kaldakvísl, Sauðafell	30	30	25	20	18	18	18	18	30	40	40	40	
Þórisós, Vað	12	12	12	12	12	11	11	11	13	14	14	13	
Kaldakvísl + Þórisós	42	42	37	32	30	29	29	29	43	54	54	53	

Fig. 4 (opposite)

<u>Hvítá River at Gullfoss</u>

Weekly Averages of Discharge for the Water Years 1949/54

RAFORKUMÁLASTJÓRI
Vatnamælingar.

HVÍTÁ, GULLFOSS
Vikumeðalrennsli.

20.5.'59 S.Rist/ PJ	
TNR. 154	
B-274	Vhm.87/II
FNR. 4329	

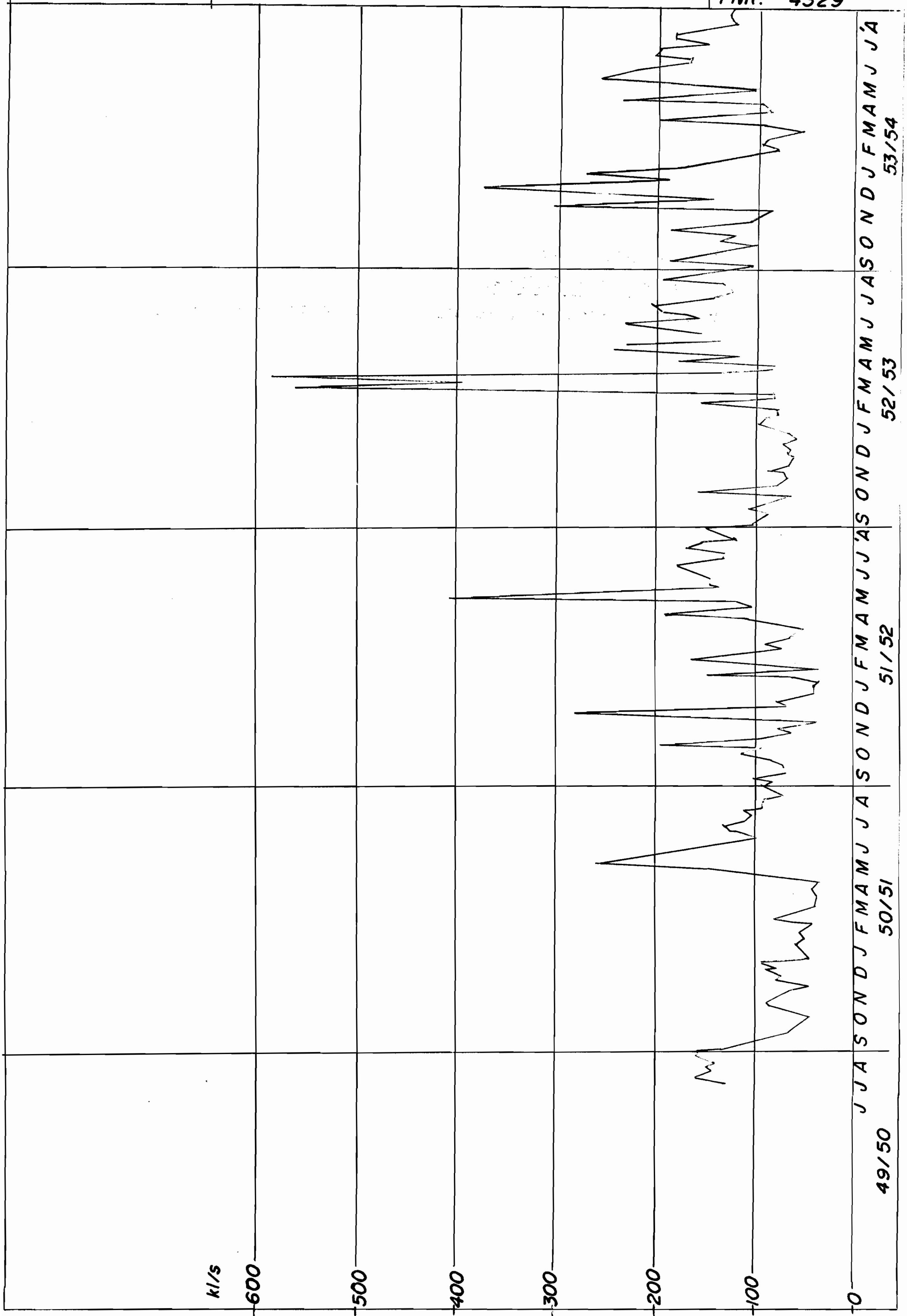


Fig. 5 (opposite)

Hvítá River at Gullfoss

Weekly Averages of Discharge for the Water Years 1954/58

RAFORKUMÁLASTJÓRI
Vatnamælingar.

HVÍTÁ, GULLFOSS.
Vikumeðalrennsli.

21. 5.'59 S.Rist / PJ	
TNR. 155	
B-274	Vhm 87/10
FNR. 4330	

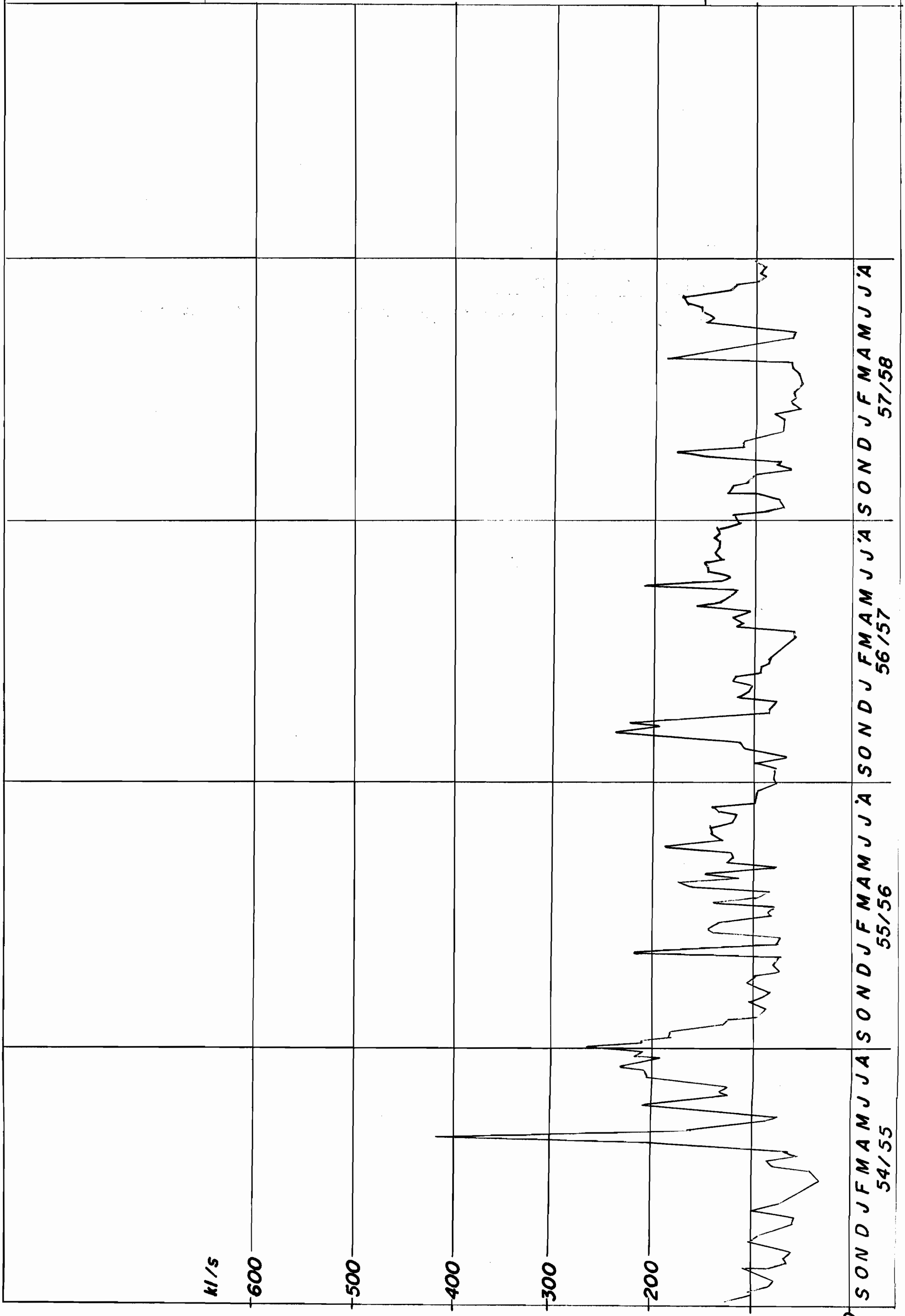


Fig. 6 (opposite)

Tungufljót River at Faxi

Weekly Averages of Discharge for the Water Years 1951/55

	RAFORKUMÁLASTJÓRI Vatnamælingar TUNGUFLJÓT, FAXI Vikumeðalrennsli	20.5.'59 S.Rist/PJ TNR 146 B-274 Vhm 68/4 FNR. 4321

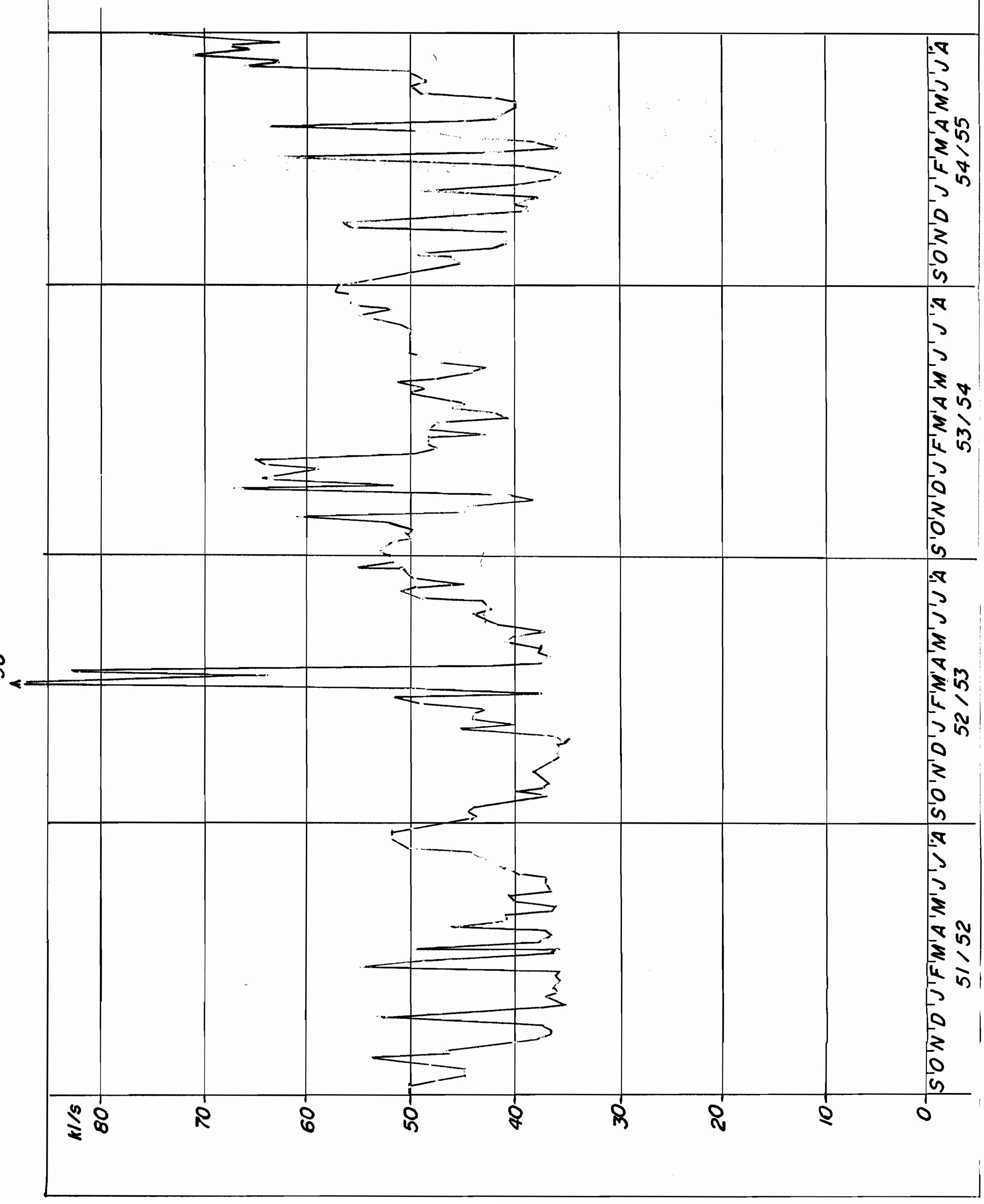


Fig. 7 (opposite)

Tungufljót River at Faxi

Weekly Averages of Discharge for the Water Years 1955/58

	RAFORKUMÁLASTJÓRI Vatnamælingar **TUNGUFLJÓT, FAXI.** *Vikumeðalrennsli*	20.5.'59 S.Rist/PJ TNR 147 B – 274 Vhm68/5 FNR. 4322

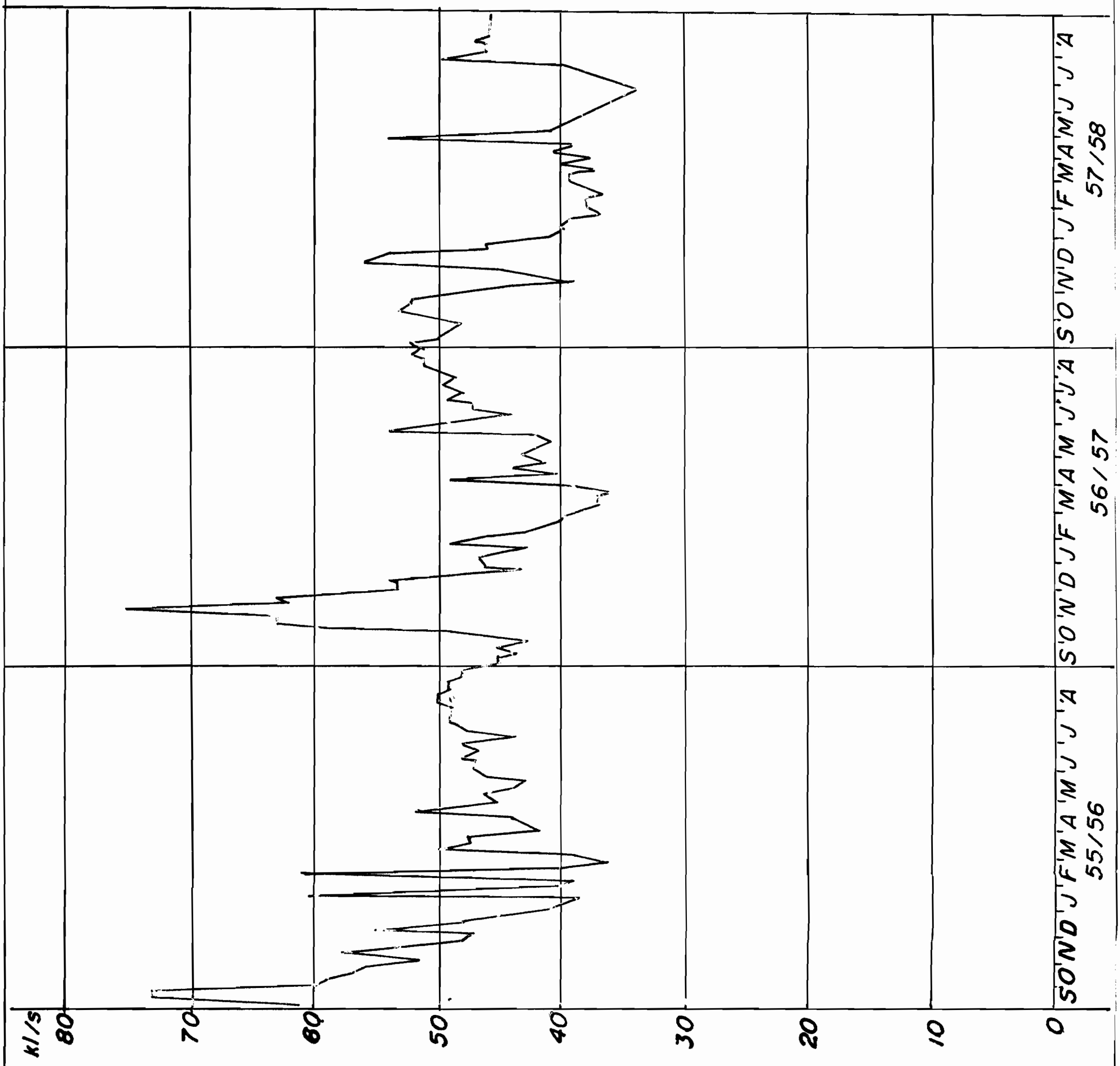


Fig. 8 (opposite)

Brúará River at Dynjandi

Weekly Averages of Discharge for the Water Years 1948/53

RAFORKUMÁLASTJORI
Vatnamælingar

BRÚARÁ, DYNJANDI.
Vikumeðalrennsli.

20.5.'59 S.Rist / PJ
TNR. 142
B- 274 Vhm 43/5
FNR. 4317

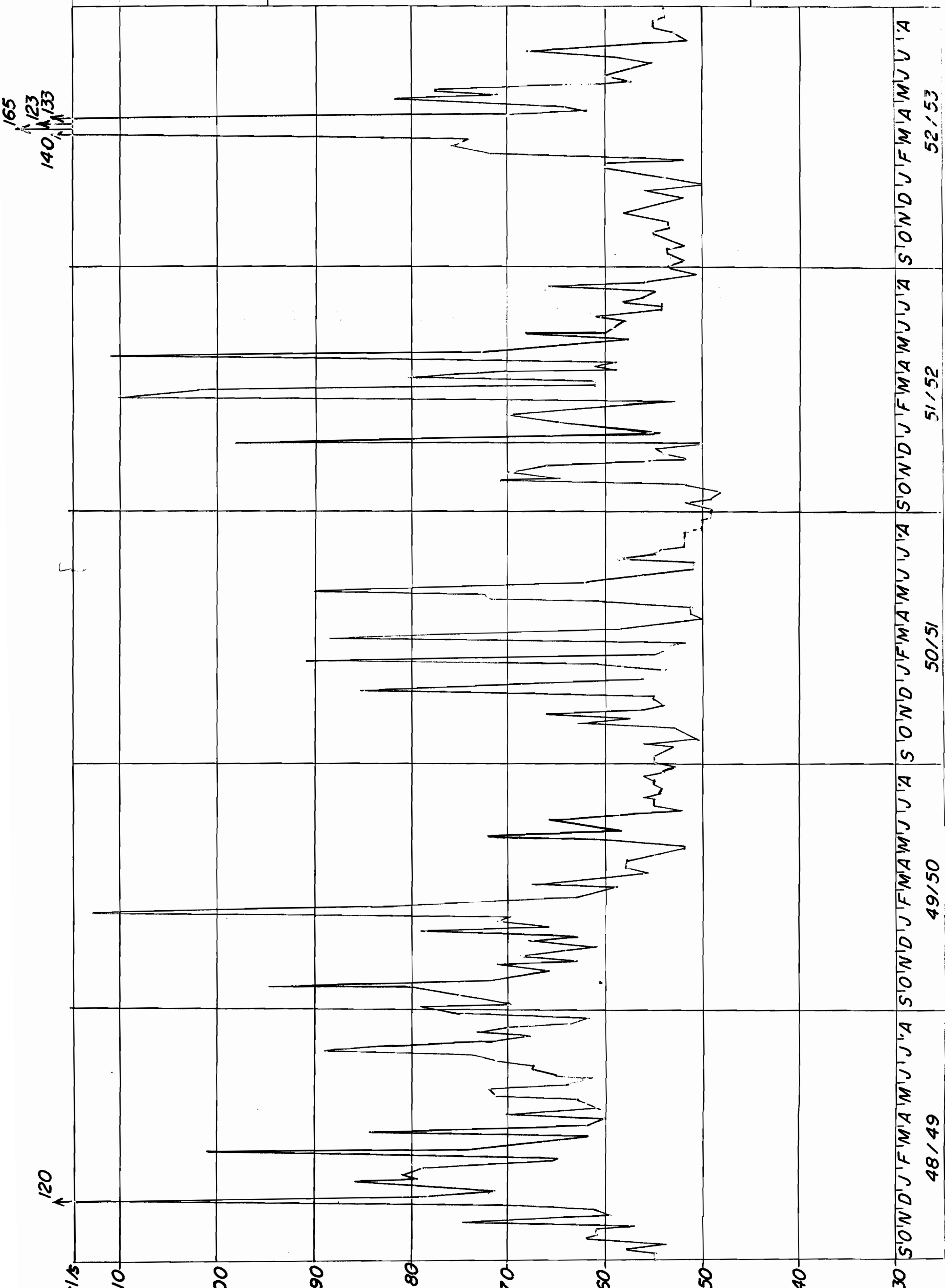


Fig. 9 (opposite)

Brúará River at Dynjandi

Weekly Averages of Discharge for the Water Years 1953/58

RAFORKUMÁLASTJÓRI
Vatnamæling
BRÚARÁ, DYNJANDI.
Vikumeðalrennsli.

20.5.'59 S.Rist / PJ	
TNR	143
B 274	Vhm 43/6
FNR	4318

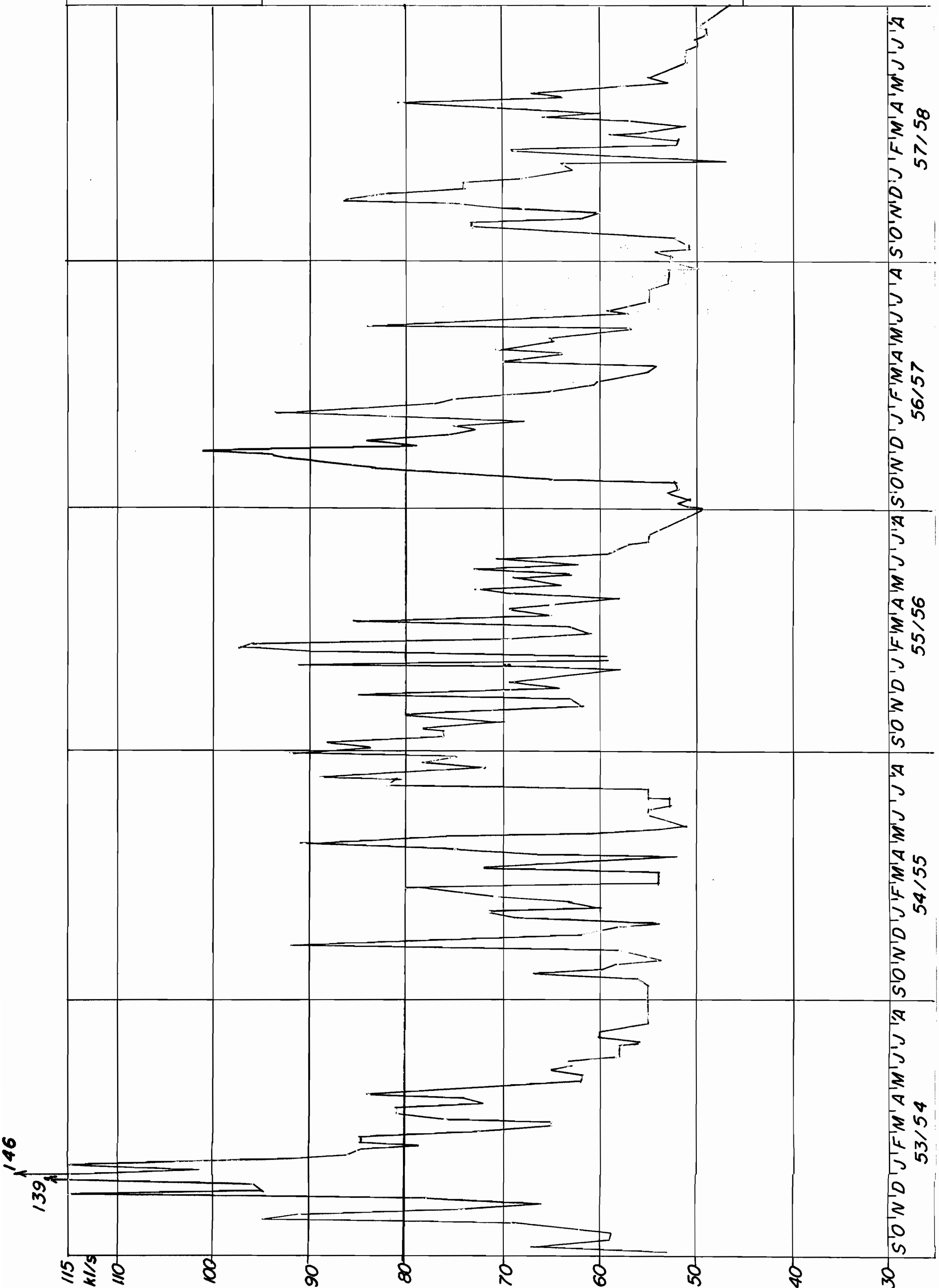


Fig. 10 (opposite)

Hvítá River at Hestfjall

Weekly Averages of Discharge for the Water Years 1950/54

RAFORKUMÁLASTJÓRI
Vatnamælingar,
HVÍTÁ, HESTFJALL. Árhraun.
Vikumeðalrennsli.

20.5.'59. S.Rist / PJ
TNR. 144
B - 274 vh. 107/3
FNR. 4319

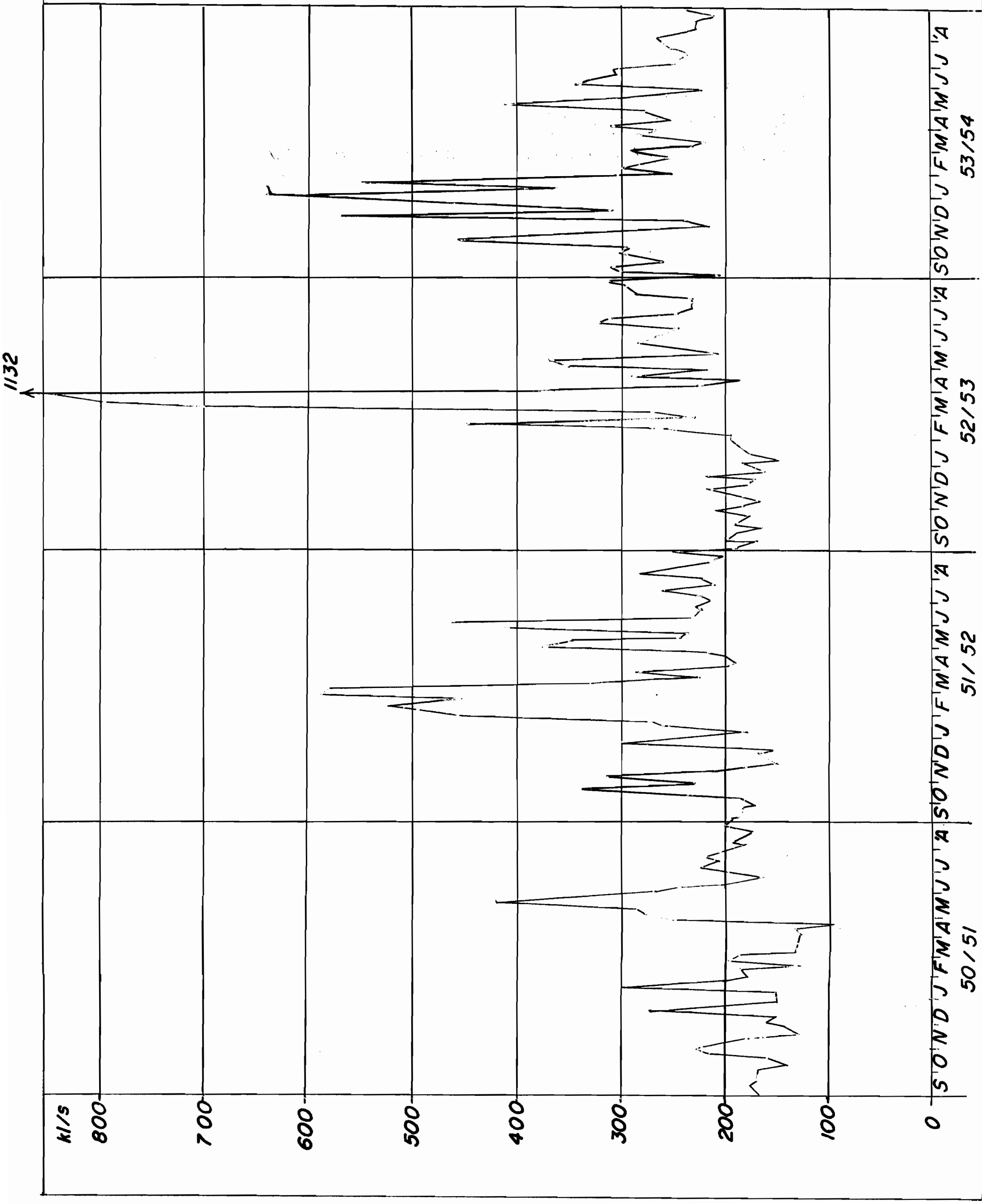


Fig. 11 (opposite)

Hvítá River at Hestfjall

Weekly Averages of Discharge for the Water Years 1954/58

	RAFORKUMÁLASTJÓRI *Vatnamælingar* *HVÍTÁ, HESTFJALL, Árhraun.* *Vikumeðalrennsli*	*20.5.59 S. Rist / PJ* *TNR 145* *B - 274 Vhm 107/4* *FNR. 4320*

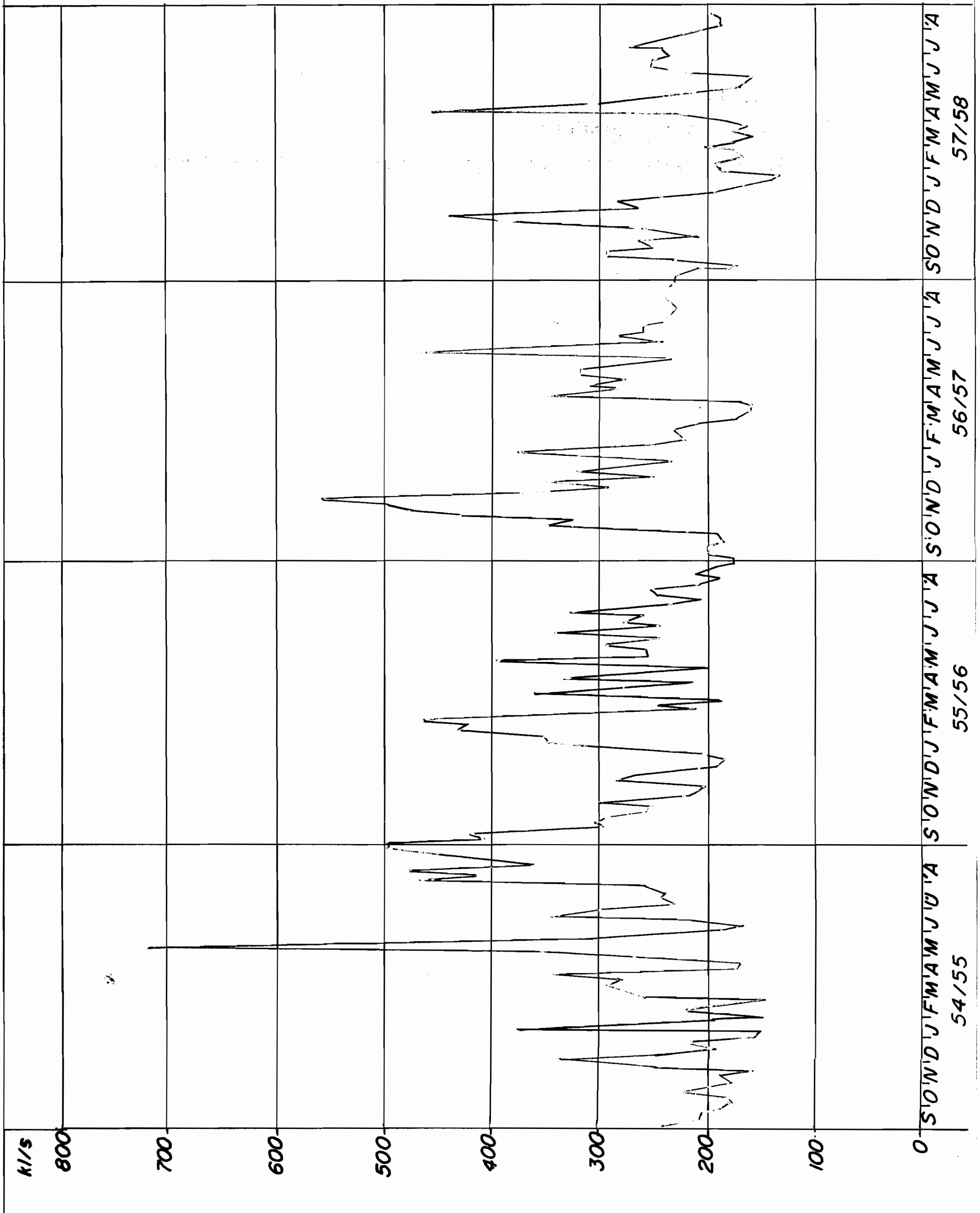


Fig. 12 (opposite)

Sog River at Ljósafoss

Weekly Averages of Discharge for the Water Years 1939/44

RAFORKUMÁLASTJÓRI
Vatnamælingar.

SOGIÐ, LJÓSAFOSS.
Vikumeðalrennsli.

20.5.'59 S.Rist / PJ
TNR. 150
B-274 Vhm 2
FNR. 4325

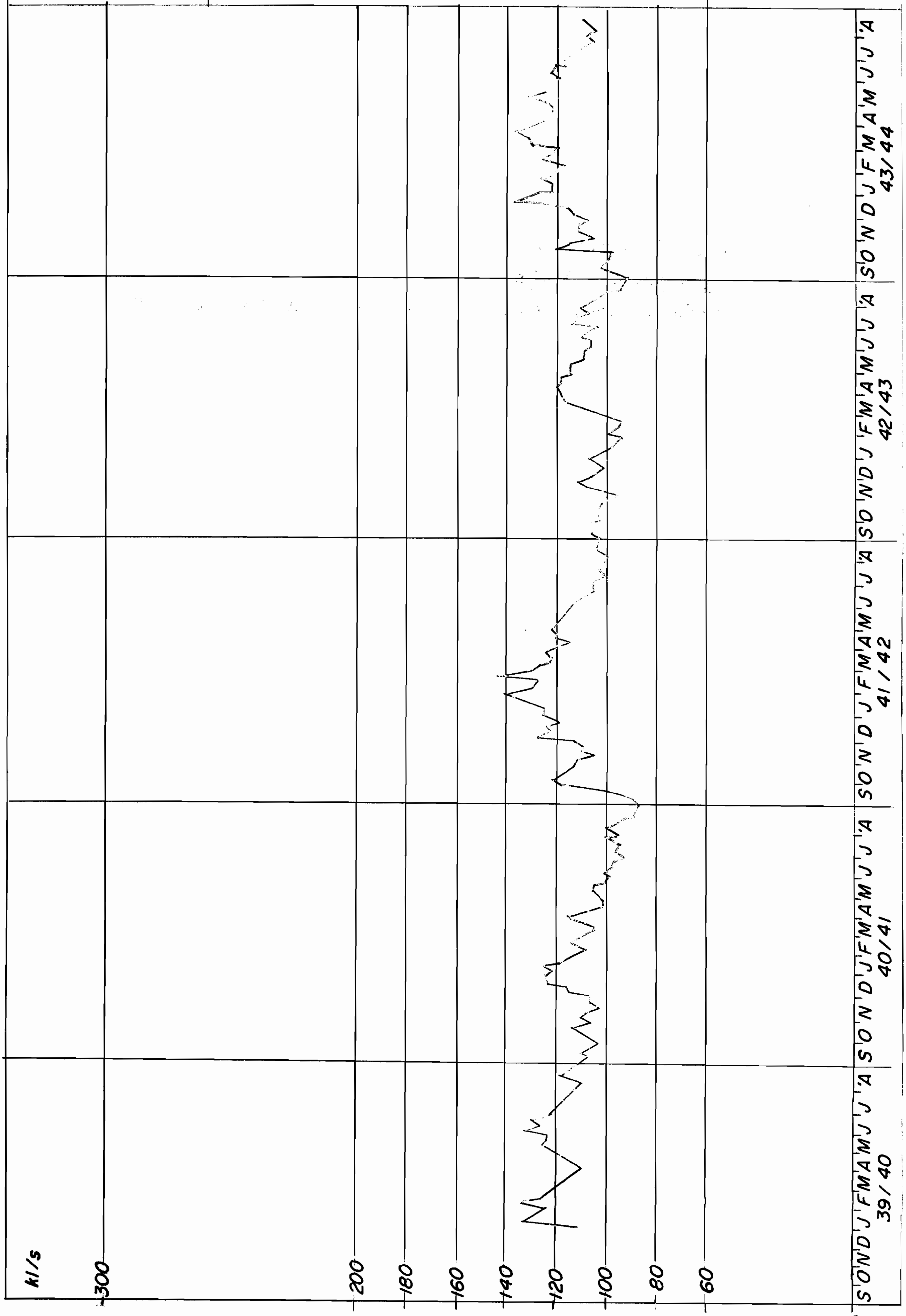


Fig. 13 (opposite)

Sog River at Ljósafoss

Weekly Averages of Discharge for the Water Years 1944/49

RAFORKUMÁLASTJÓRI *Vatnamælingar.*	20.5.'59. S.Rist/PJ.
SOGIÐ, LJÓSAFOSS. *Vikumeðalrennsli.*	TNR. 152
	B-274 Vhm 2
	FNR. 4327

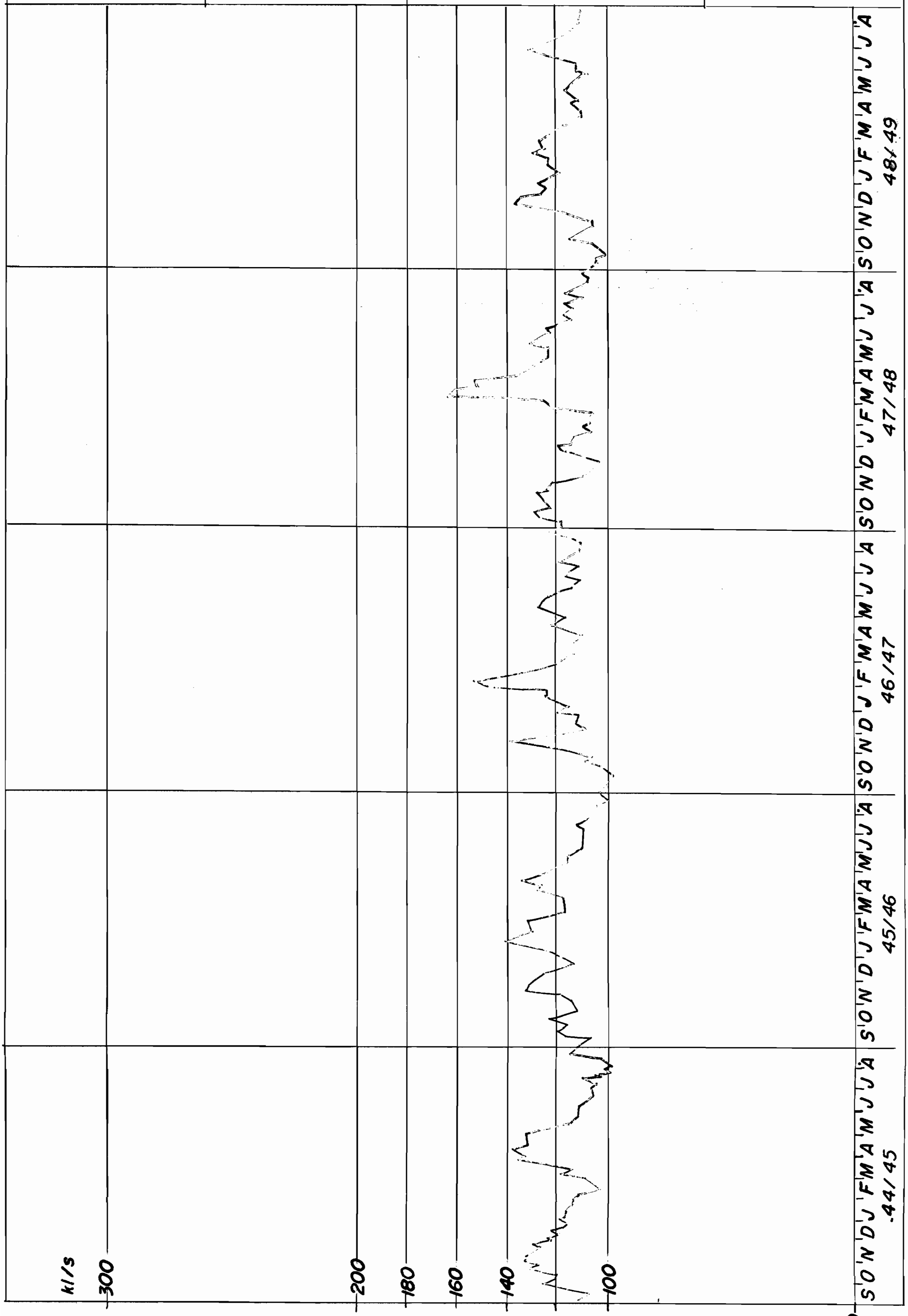


Fig. 14 (opposite)

Sog River at Ljósafoss

Weekly Averages of Discharge for the Water Years 1949/54

	RAFORKUMÁLASTJÓRI Vatnamælingar. SOGIÐ, LJÓSAFOSS. Vikumeðalrennsli.	20.5.'59. S.Rist/ PJ TNR. 151 B-274 Vhm. 2 FNR. 4326

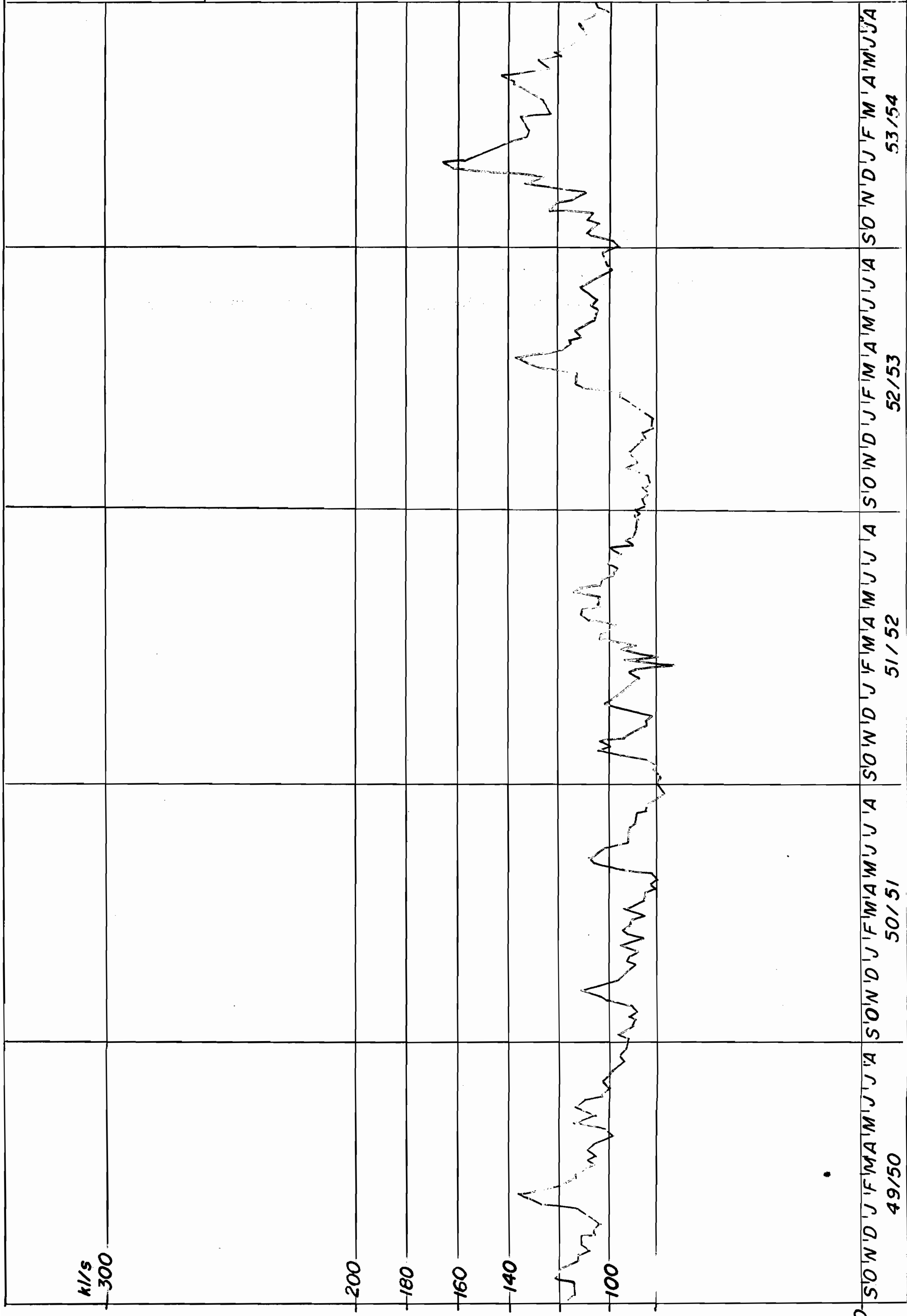


Fig. 15 (opposite)

Sog River at Ljósafoss

Weekly Averages of Discharge for the Water Years 1954/58

	RAFORKUMÁLASTJÓRI *Vatnamælingar.* **SOGIÐ, LJÓSAFOSS.** *Vikumeðalrennsli.*	20.5.'59 S.Rist/ PJ. TNR. 153 B– 274 Vhm. 2 FNR. 4328

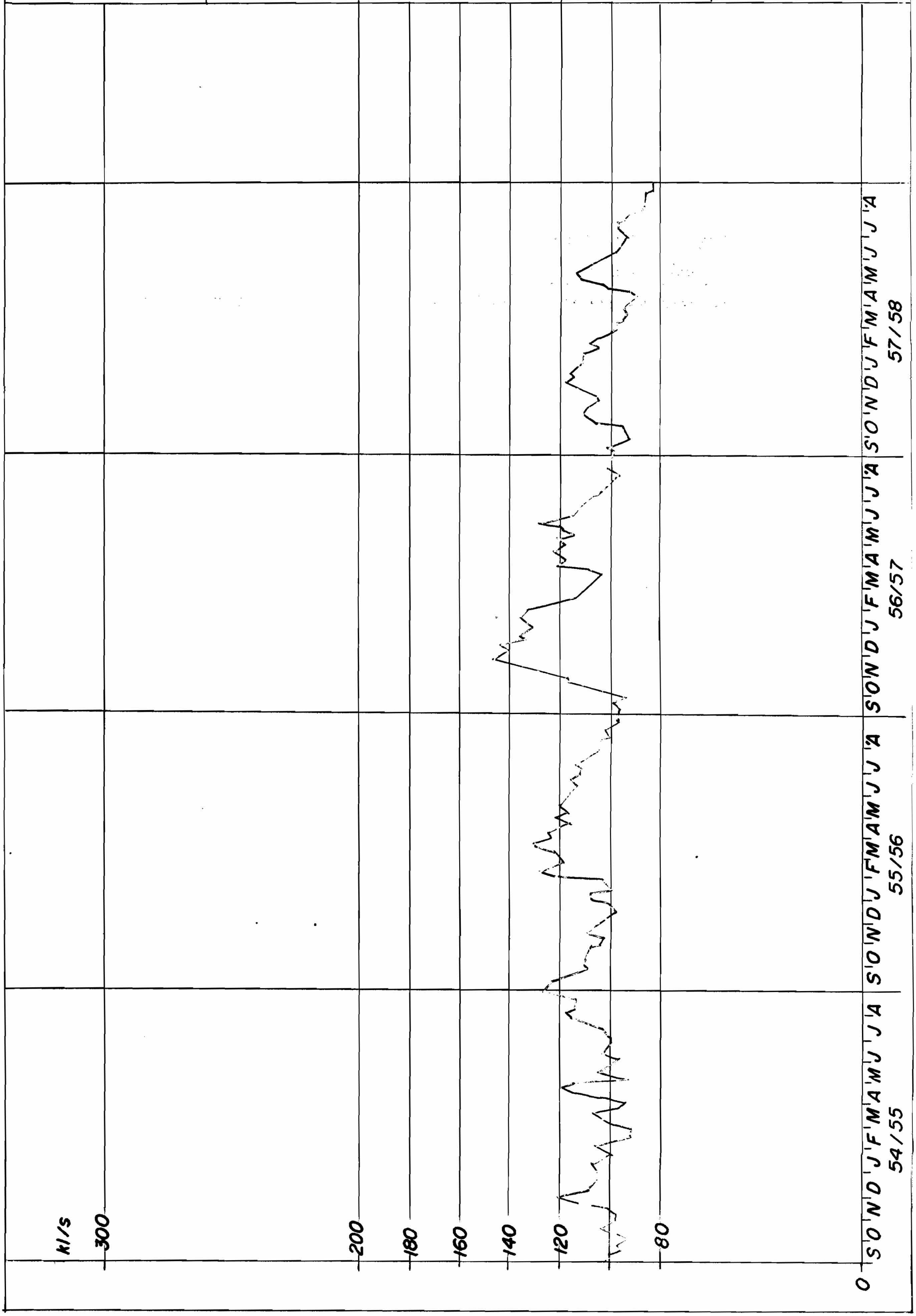


Fig. 16 (opposite)

Ölfusá River at Selfoss

Weekly Averages of Discharge for the Water Years 1950/54

RAFORKUMÁLASTJÓRI
Vatnamælingar

ÖLFUSÁ, SELFOSS

Vikumeðalrennsli

20.5.'59. S.Rist/PJ

TNR 148

B-274 Vhm. 64/9

FNR. 4323

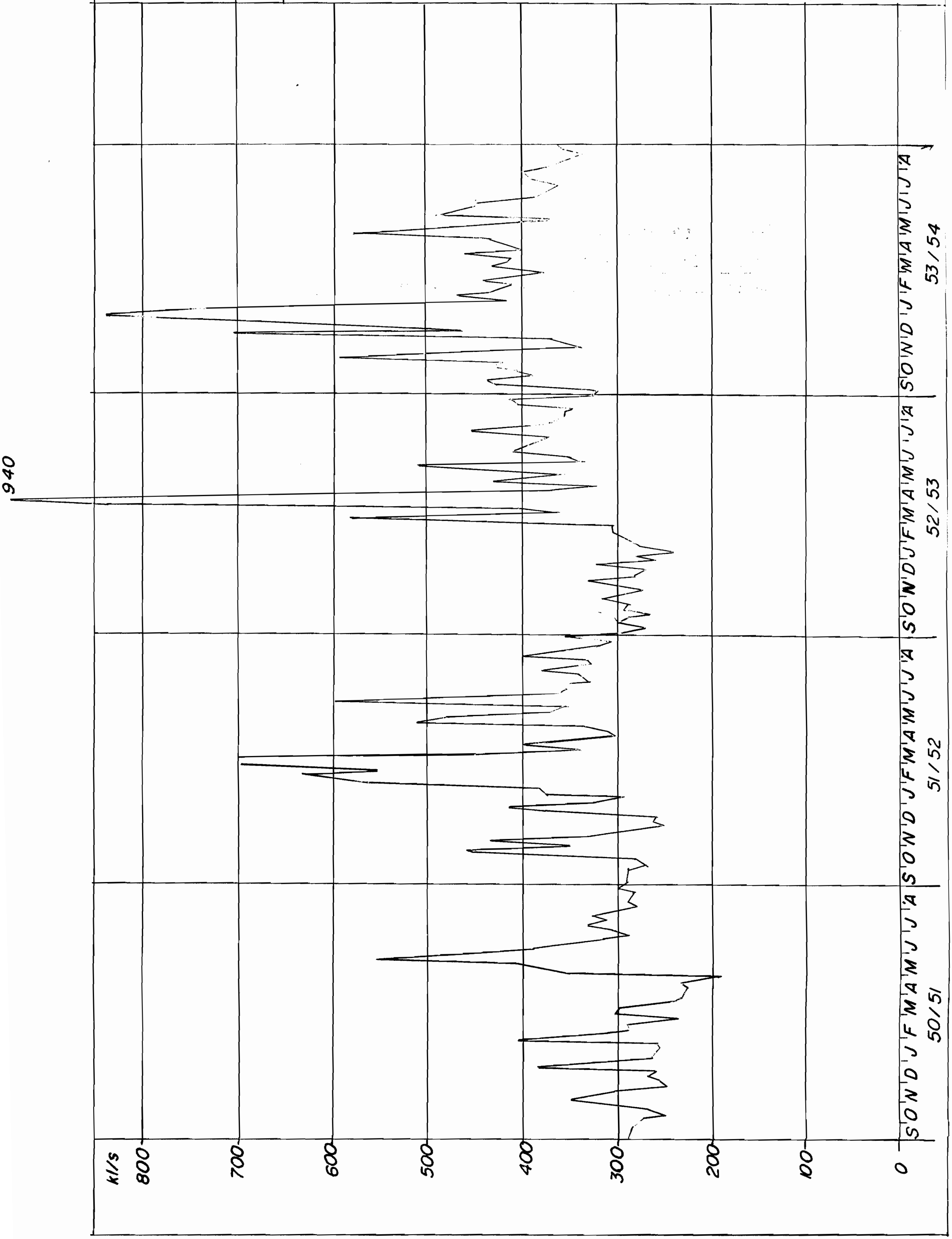


Fig. 17 (opposite)

Ölfusá River at Selfoss

Weekly Averages of Discharge for the Water Years 1954/58

RAFORKUMÁLASTJÓRI
Vatnamælingar
ÖLFUSÁ, SELFOSS.
Vikumeðalrennsli.

20.5.'59. S.Rist/ PJ
TNR. 149
B-274-Vhm. 64/10
FNR. 4324

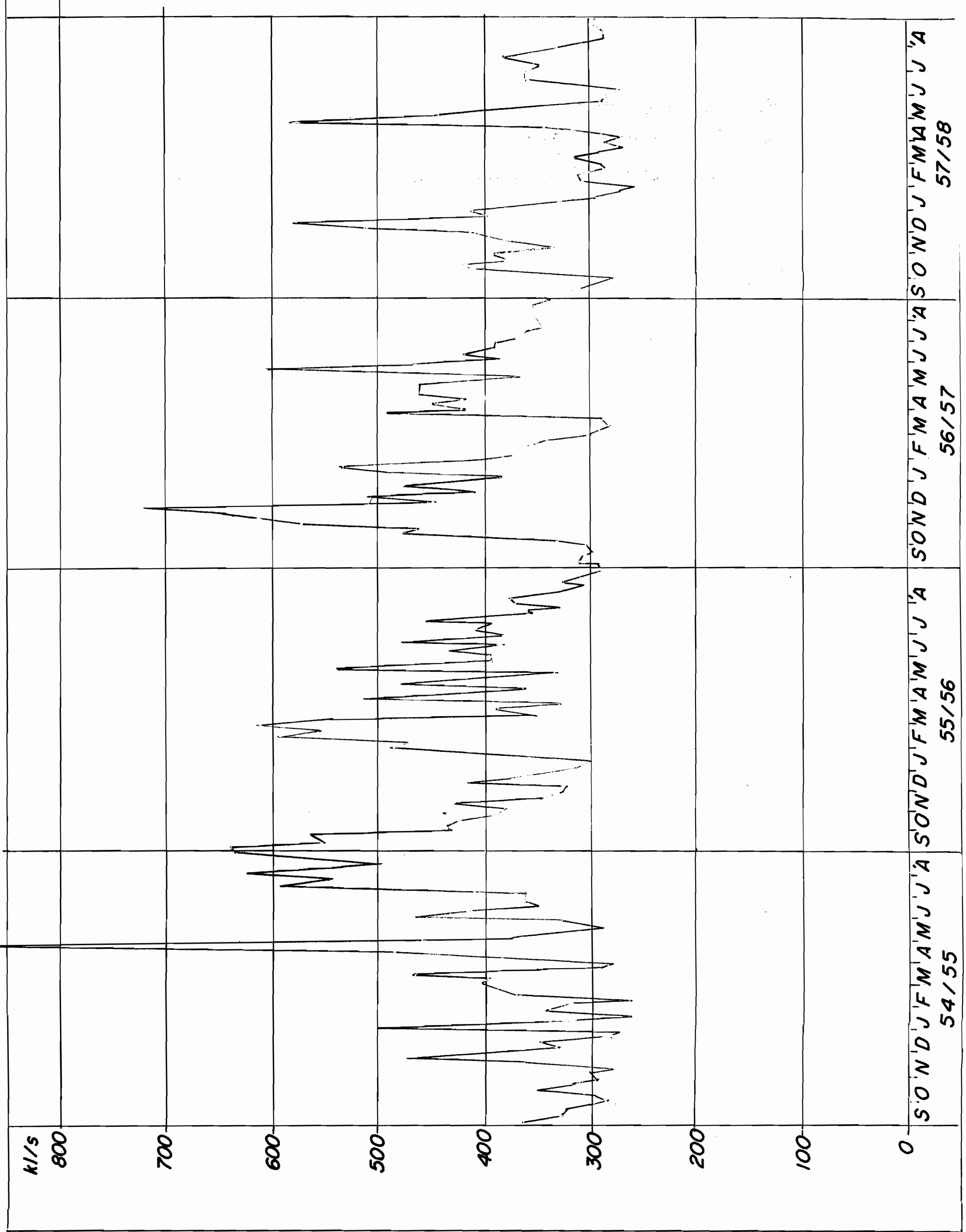


Fig. 18 (opposite)

Þjórsá River at Urriðafoss

Weekly Averages of Discharge for the Water Years 1946/50

RAFORKUMÁLASTJÓRI
Vatnamælingar

ÞJÓRSÁ, URRIÐAFOSS.

Vikumeðalrennsli.

19.6.'59 S.Rist/PJ	
TNR. 196	
B-277 Vhm 30/23	
FNR. 4350	

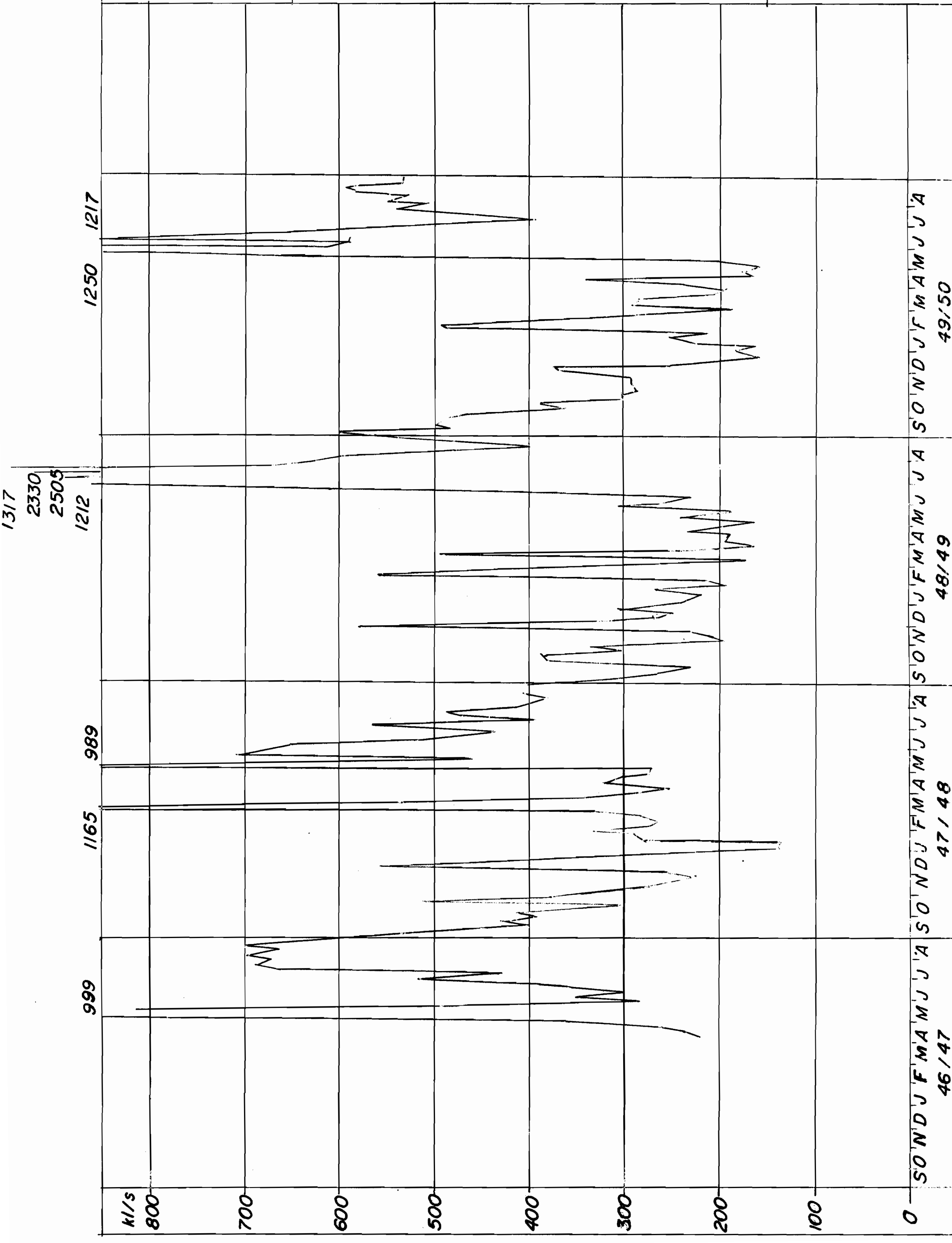


Fig. 19 (opposite)

Þjórsá River at Urriðafoss

Weekly Averages of Discharge for the Water Years 1950/54

RAFORKUMÁLASTJÓRI Vatnamælingar ÞJÓRSÁ, URRIÐAFOSS Vikumeðalrennsli	19.6.59 S.Risð/PJ TNR. 197 B-277 Vh30/24 FNR. 4351

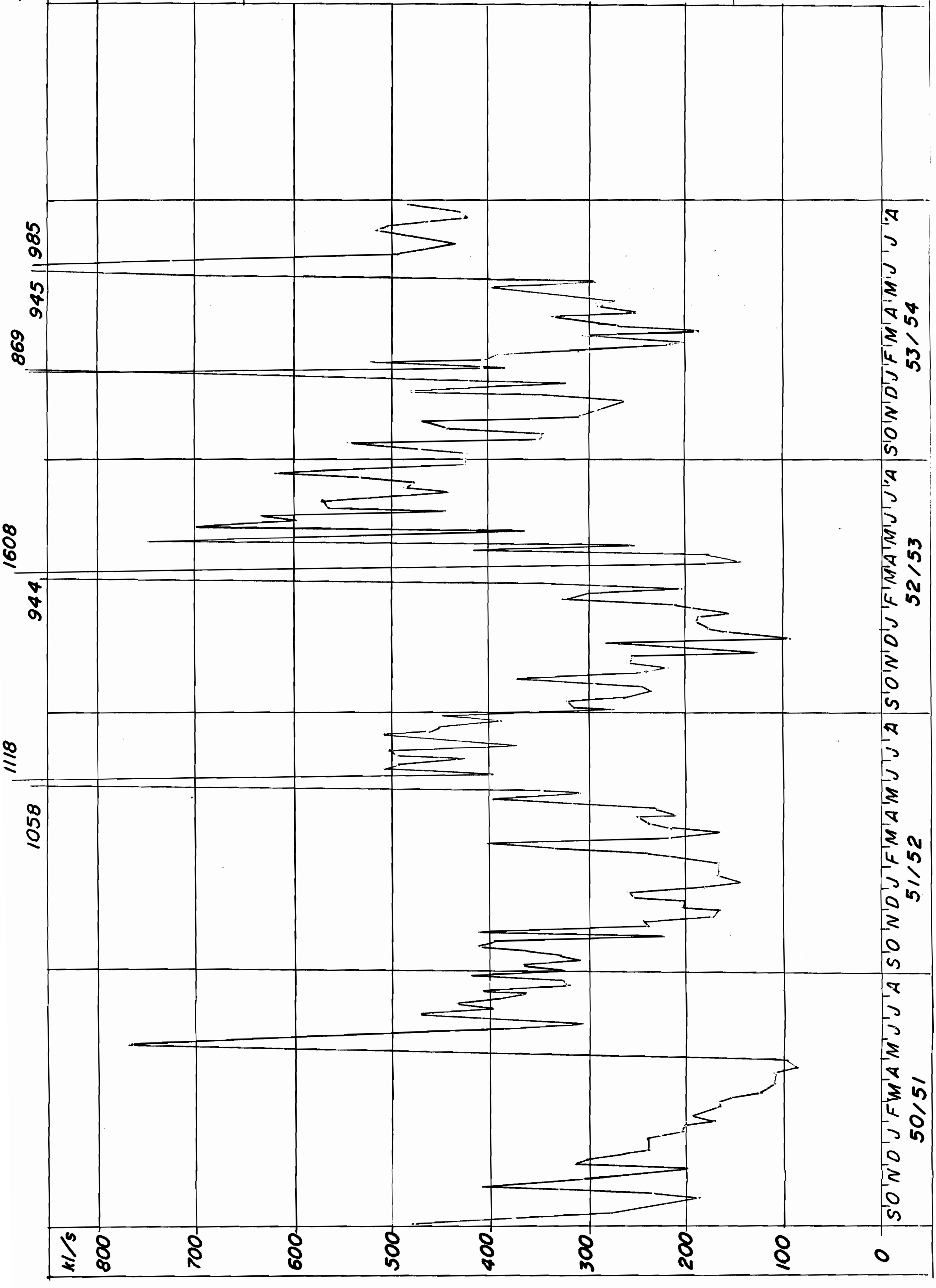


Fig. 20 (opposite)

Þjórsá River at Urriðafoss

Weekly Averages of Discharge for the Water Years 1954/58

	RAFORKUMÁLASTJÓRI Vatnamælingar. ÞJÓRSÁ, URRIÐAFOSS. Vikumeðalrennsli	19.6.'59. S.Rist / PJ TNR. 198 B-277 Vhm 30/25 FNR. 4352

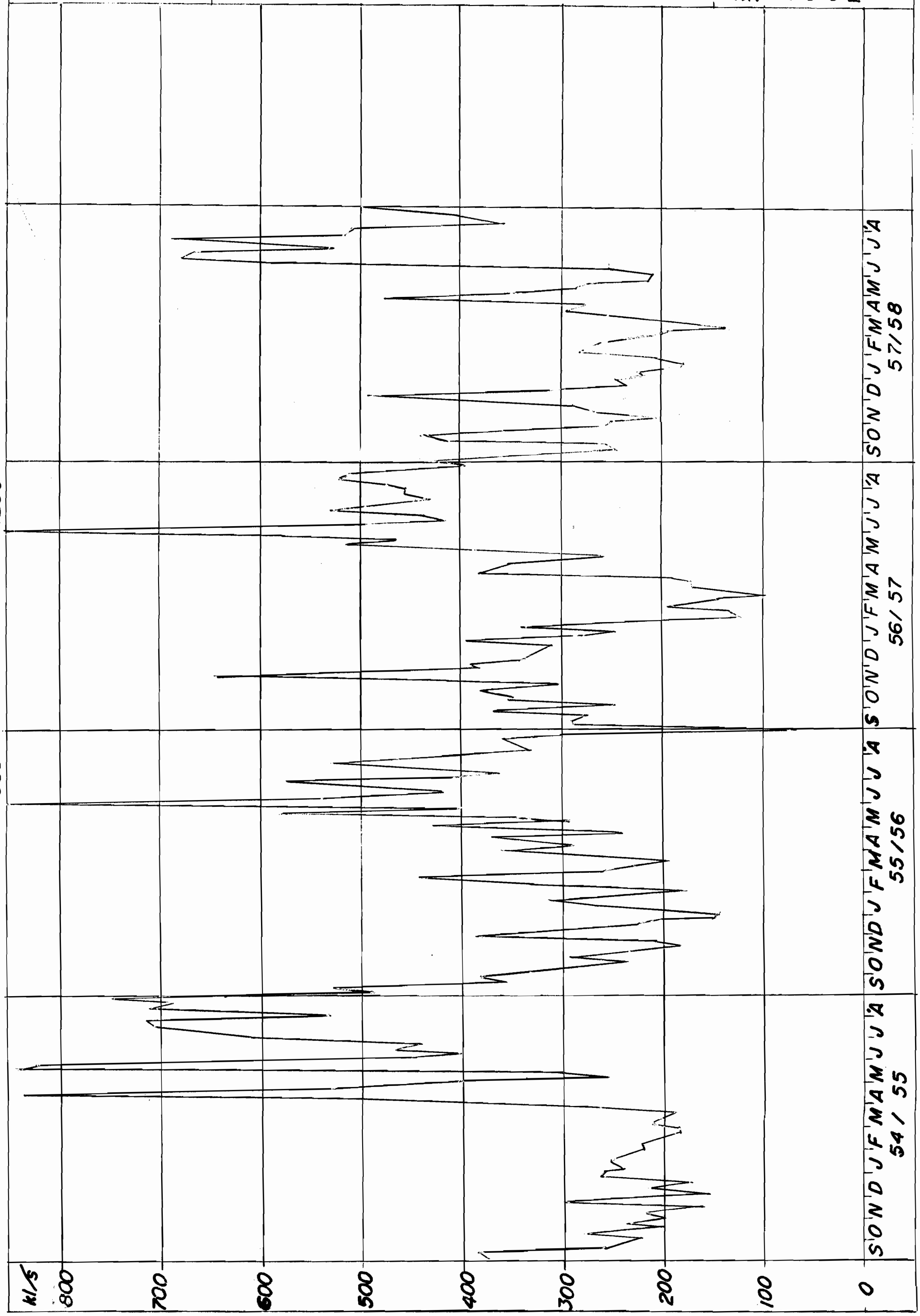


Fig. 21 (opposite)

Hvítá River at Gullfoss

Flow Duration Curve (A) and Flow Utilization Curve (B) for the Period of Record. (8 whole Water Years, 1950/50)

Curve (A), the flow duration curve shows the percentage or time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water, expressed as a percentage of the total run-off, utilized by a hydro-plant without any storage, having the given discharge as rated discharge. (Curve (B) also shows the area below the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area bolow the flow duration curve).

Vatnasvið
2000 km²

RAFORKUMÁLASTJÓRI.
HVÍTÁ, GULLFOSS.
LANGÆISLÍNA 8 ÁRA,
1950- 1958.

20.6.'59 PJ.
TNR. 163
B- 274 Vhm 87/13
FNR- 4348

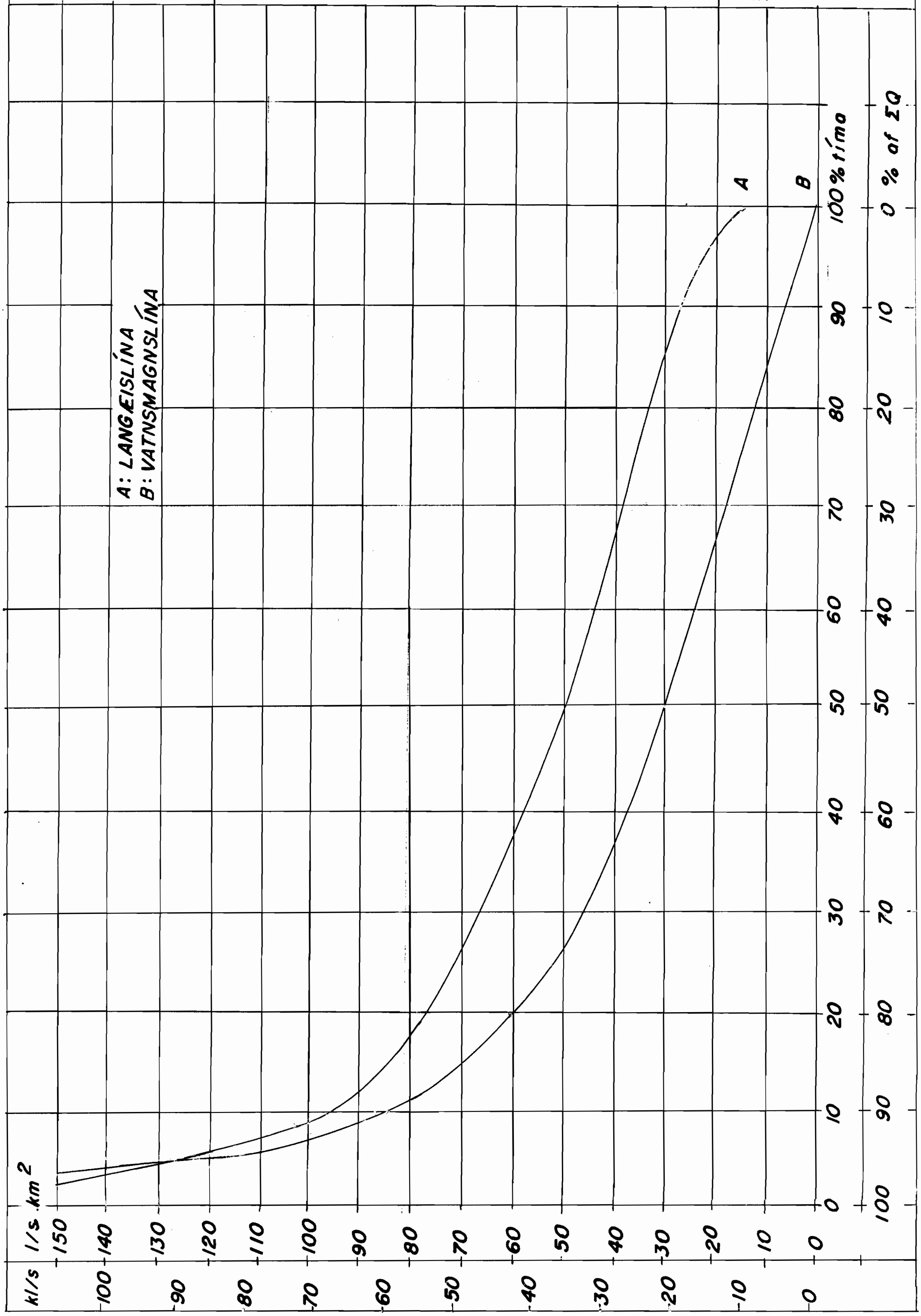


Fig. 22 (opposite)

Tungufljót River at Faxi

Flow Duration Curve (A) and Flow Utilization Curve (B) for the Period of Record. (7 whole Water Years, 1951/58)

Curve (A), the flow duration curve shows the percentage of time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water, expressed as a percentage of the total run-off, utilized by a hydro-plant without any storage, having the given discharge as rated discharge.
(Curve (B) also shows the area below the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area below the flow duration curve).

Vatnasvið 720 km^2	RAFORKUMÁLASTJÓRI. Vatnamælingar. TUNGUFLJÓT, FAXI. LANGÆISLÍNA, 7 ÁRA 1951 / 58.	8.6.59 PJ TNR. 161 B-274 68/6 FNR. 4338

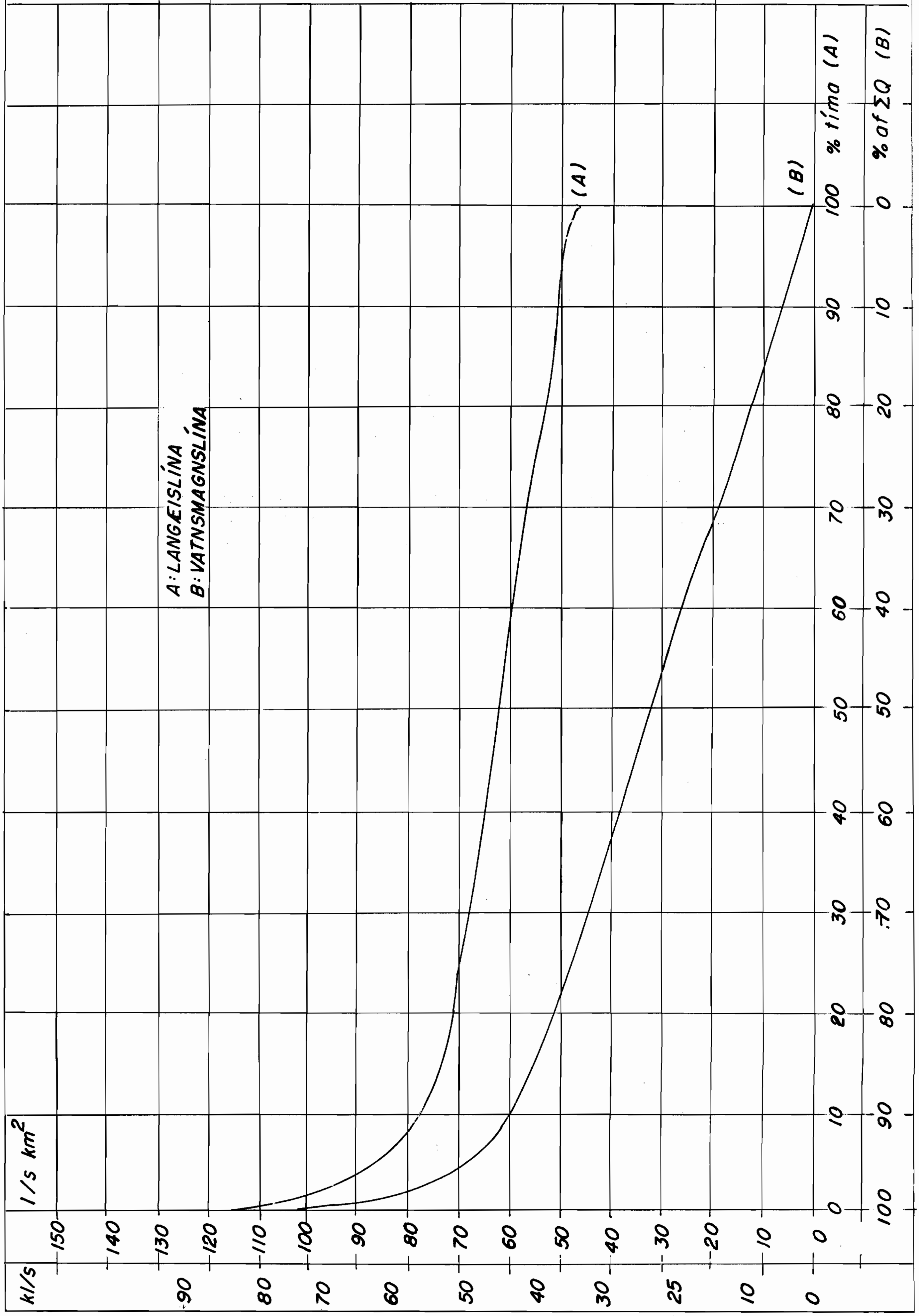


Fig. 23 (opposite)

Brúará River at Dynjandi

Flow Duration Curve (A) and Flow Utilization Curve (B) for the Period of Record. (10 whole Water Years, 1948/58)

Curve (A), the flow duration curve shows the percentage of time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water, expressed as a percentage of the total run-off, utilized by a hydro-plant without any storage, having the given discharge as rated discharge.
(Curve (B) also shows the area below the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area below the flow duration curve).

Vatnasvið 670 km^2	**RAFORKUMÁLASTJÓRI** Vatnamælingar. BRÚARÁ, DYNJANDI. LANGÆISLÍNA 10 ÁRA 1948/58.	8.6.'59 / TNR. 158 / B- 274 Vhm. 43/7 / FNR. 4334

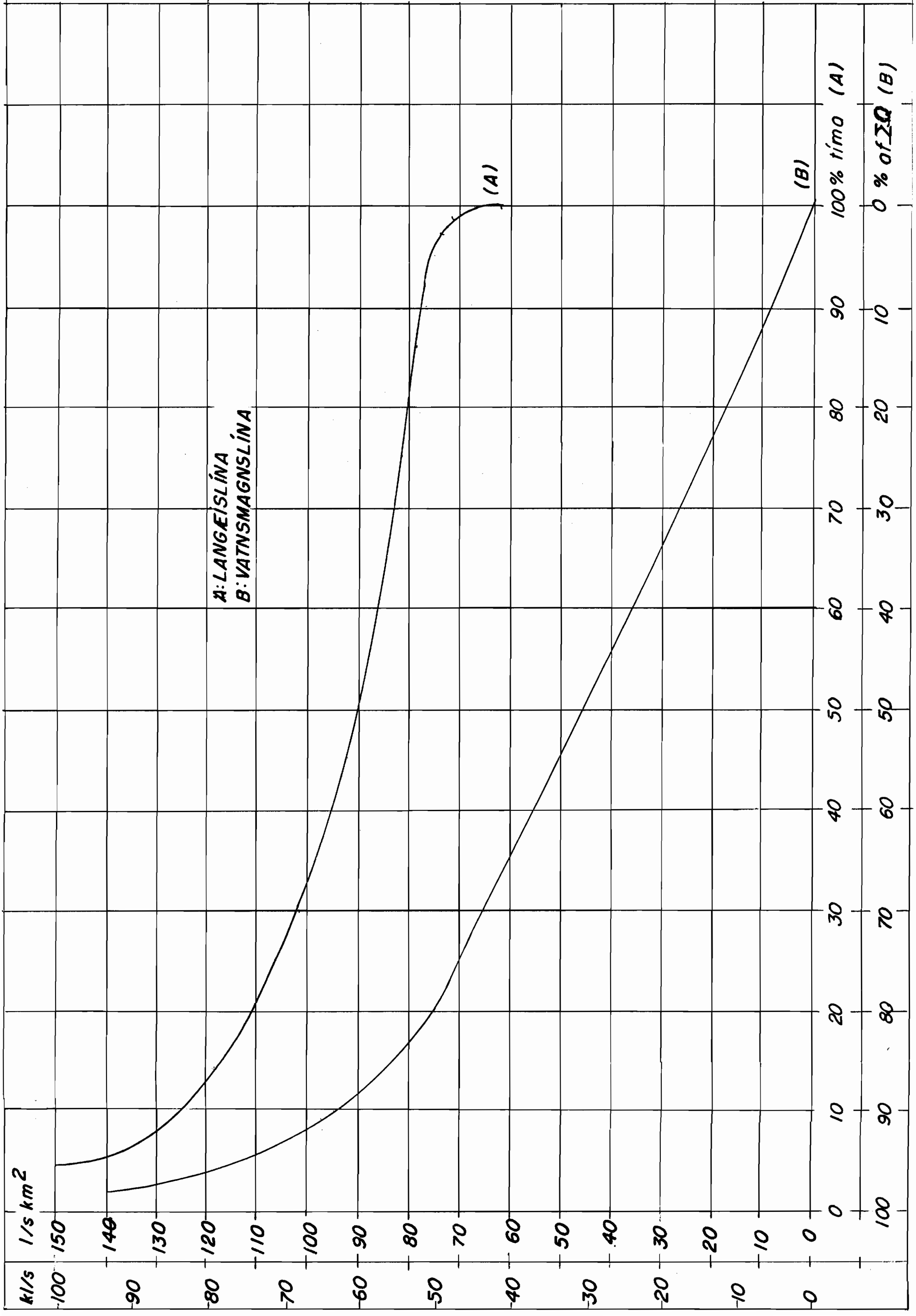


Fig. 24 (opposite)

Hvítá River at Hestfjall

Flow Duration Curves (A) and Flow Utilization Curve (B) for the Period of Record. (8 whole Water Years, 1950/58).

Curve (A), the flow duration curve shows the percentage of time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water, expressed as a percentage of the total run-off, utilized by a hydro-plant without any storage, having the given discharge as rated discharge. (Curve (B) also shows the area bolow the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area below the flow duration curve).

Vatnasvið

4,360 km²

RAFORKUMÁLASTJÓRI
Vatnamælingar.

HVITÁ, HESTFJALL.

LANGÆISLÍNA, 8 ÁRA 1950/58

8.6.'59 PJ

TNR. 162

B- 274 Vhm107/5

FNR- 4339

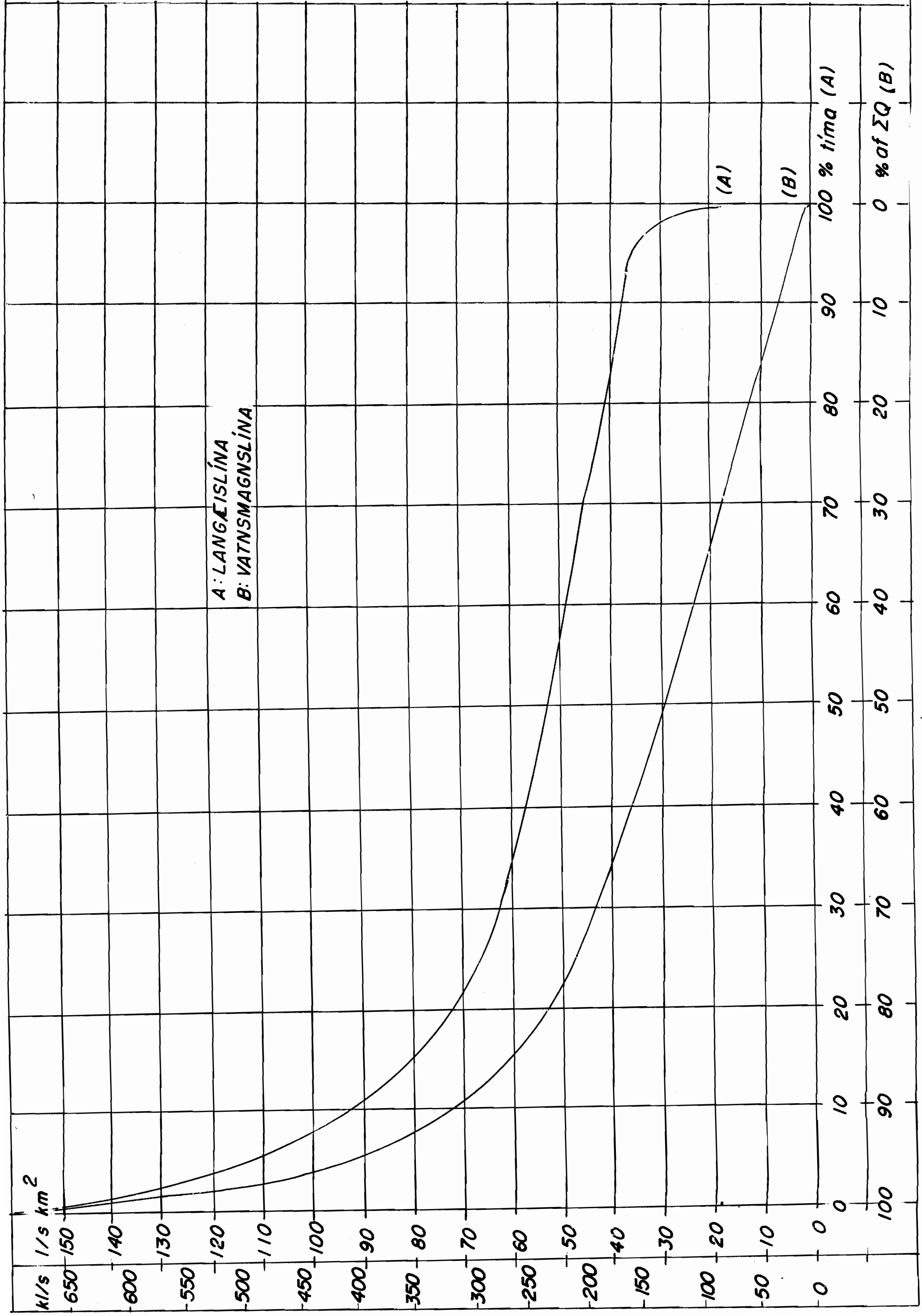


Fig. 25 (opposite)

Sog River at Ljósafoss

Flow Duration Curve (A) and Flow Utilization Curve (B) for the Period of Record. (18 whole Water Years, 1940/58).

Curve (A), the flow duration curve shows the percentage of time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water expressed as a percentage of the total run-off, utilized by a hydro-plant without any storage, having the given discharge as rated disharge.
(Curve (B) also shows the area bolow the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area below the flow duration curve).

Vatnasvið 1050 km^2	RAFORKUMÁLASTJÓRI SOGIÐ, LJÓSAFOSS LANGÆISLÍNA 18 ÁRA 1940/58.	8.6.'59 PJ TNR. 159 B-274 Vhm. 2 FNR. 4335

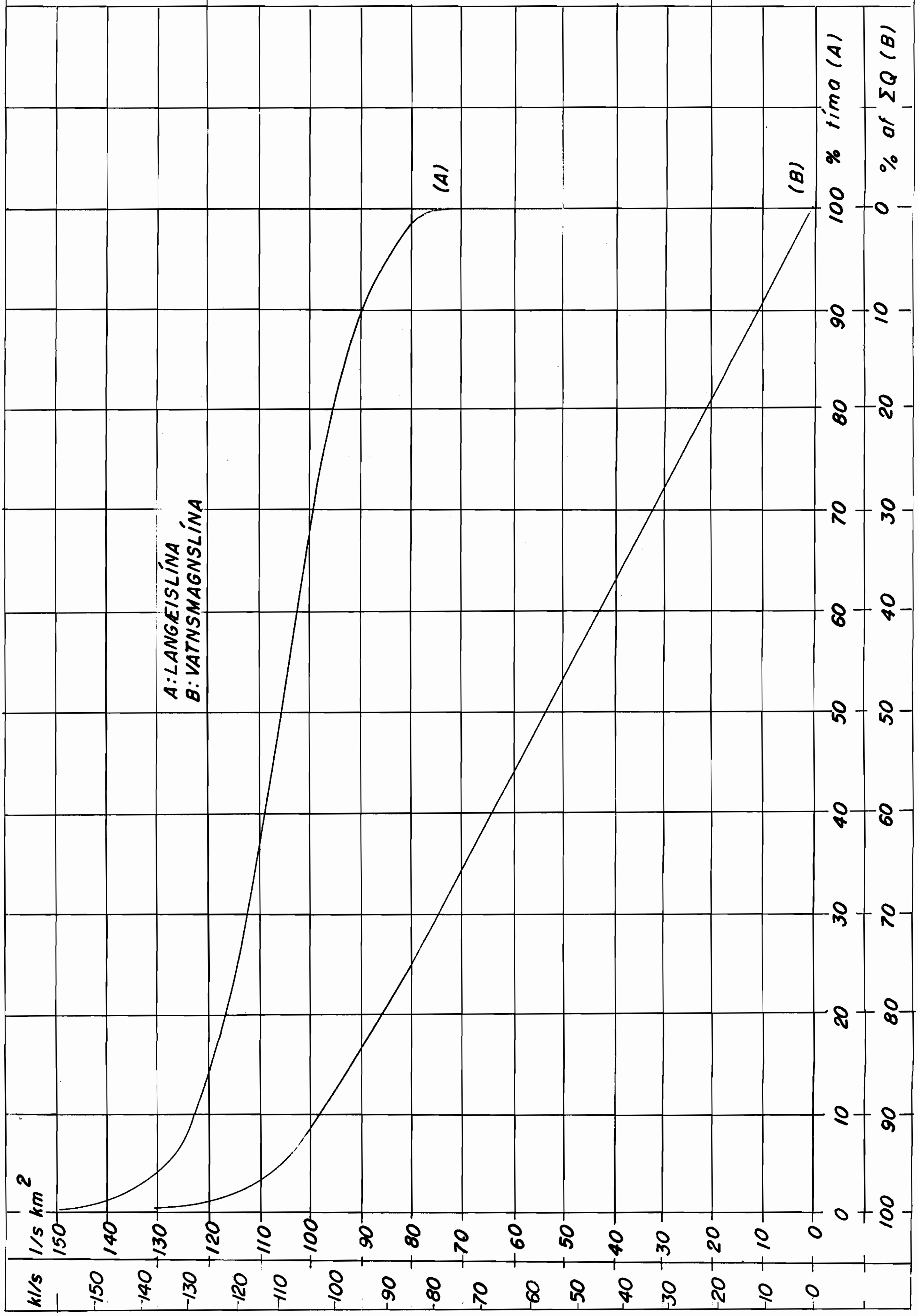


Fig. 26 (opposite)

Ölfusá River at Selfoss

Flow Duration Curve (A) and Flow Utilization Curve (B) for the Period of Record. (8 whole Water Years, 1950/58).

Curve (A), the flow duration curve shows the percentage of time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water, expressed as a percentage of the total run-off, utilized by a hydroplant without any storage, having the given discharge as rated discharge.
(Curve (B) also shows the area bolow the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area below the flow duration curve).

Vatnasvið 5760 km²	RAFORKUMÁLASTJÓRI Vatnamælingar. ÖLFUSÁ, SELFOSS. LANGÆISLÍNA 8 ÁRA 1950/58.	8.6.59 PJ TNR. 160 B-274 Vhm. 64/11 FNR 4336

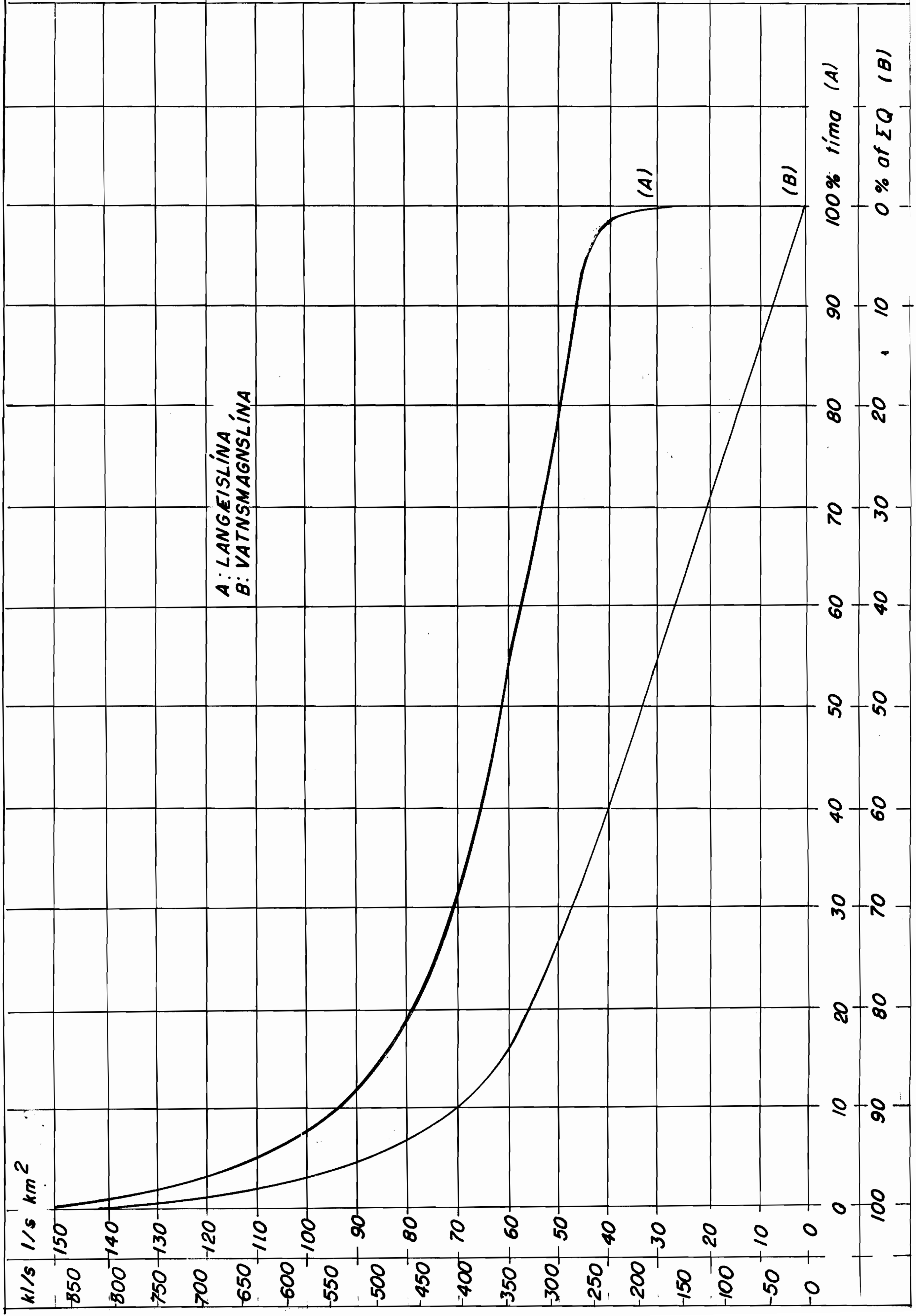


Fig. 27 (opposite)

Þjórsá River at Urriðafoss

Flow Duration Curve (A) and Flow Utilization Curve (B) for the Period of Record. (11 whole Water Years, 1947/58).

Curve (A), the flow duration curve shows the percentage of time in which a given discharge is equaled or exceeded Curve (B), the flow utilization curve, shows for a given discharge the amount of water, expressed as a percentage of the total run-off, utilized by a hydro-plant without any storage, having the given discharge as rated discharge.
(Curve (B) also shows the area below the horizontal line representing a given discharge and the flow duration curve, expressed as a percentage of the total area below the flow duration curve).

Vatnasvið 7200 km^2	**RAFORKUMÁLASTJÓRI** **ÞJÓRSÁ, URRIÐAFOSS** LANGÆISLÍNA 11 ÁR, 1947 – 1958	19.6.'59. P.J. TNR. 195 B– 277 Vhm 30/22 FNR. 4349

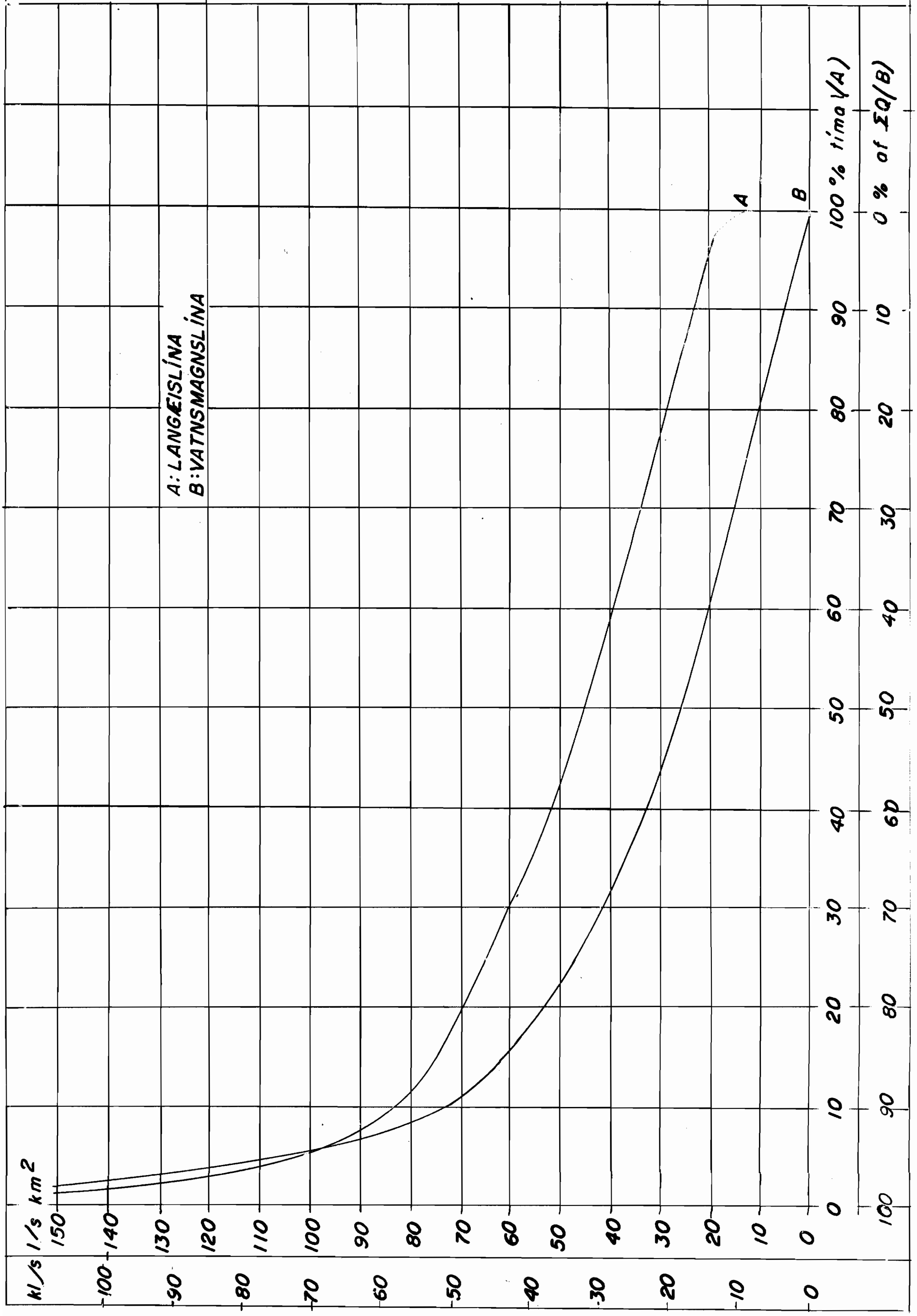


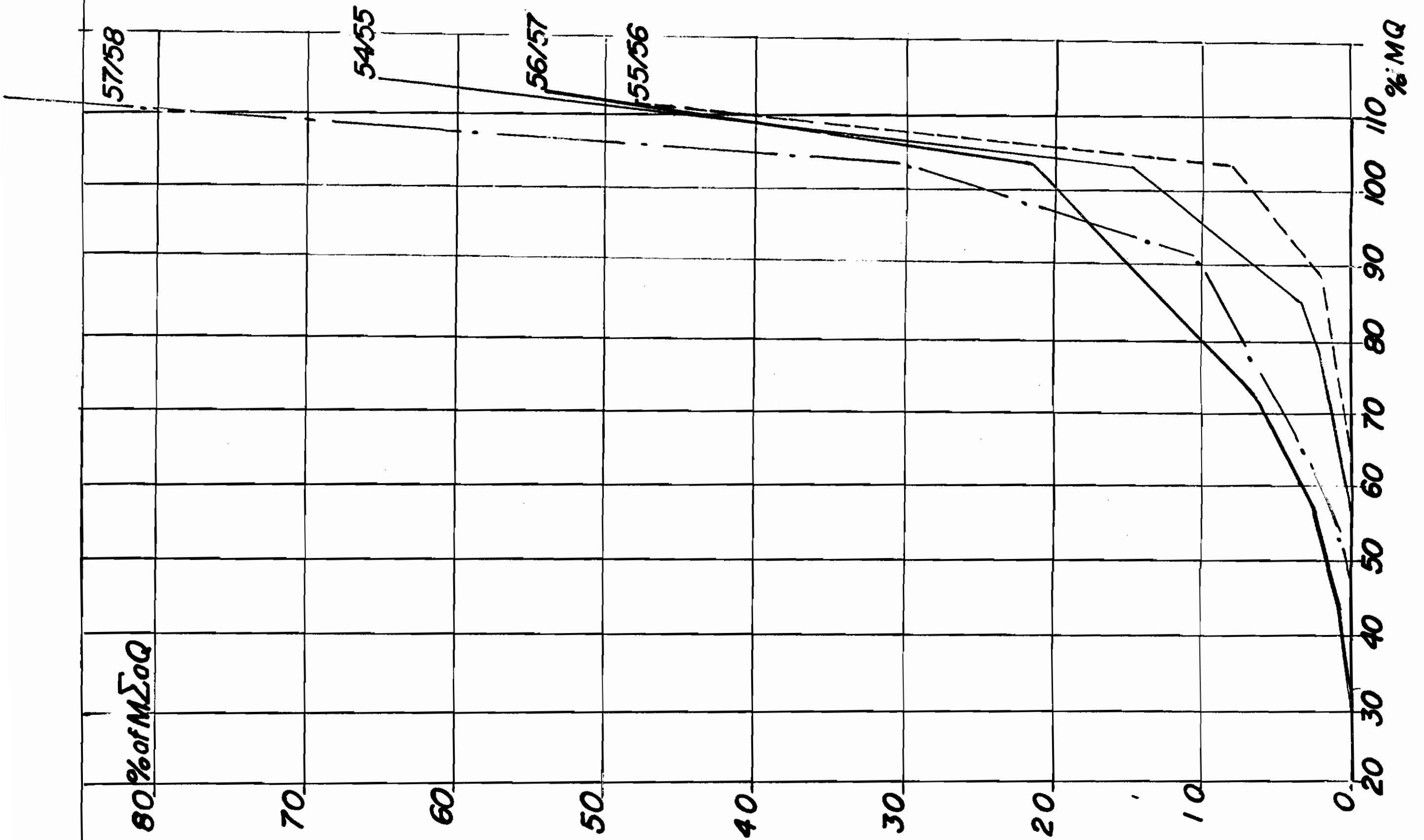
Fig. 28 (opposite)

Hvítá River at Gullfoss

Flow Regulation Curves for the Period of Record. (8 whole Water Years, 1950/58).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off (M∑aQ), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI Vatnamælingar HVÍTÁ GULLFOSS Jöfnunarlínur 8 ára 1950–58	25.5.'59 Tnr 157 B-274 . Vhm 87/12 Fnr 4332



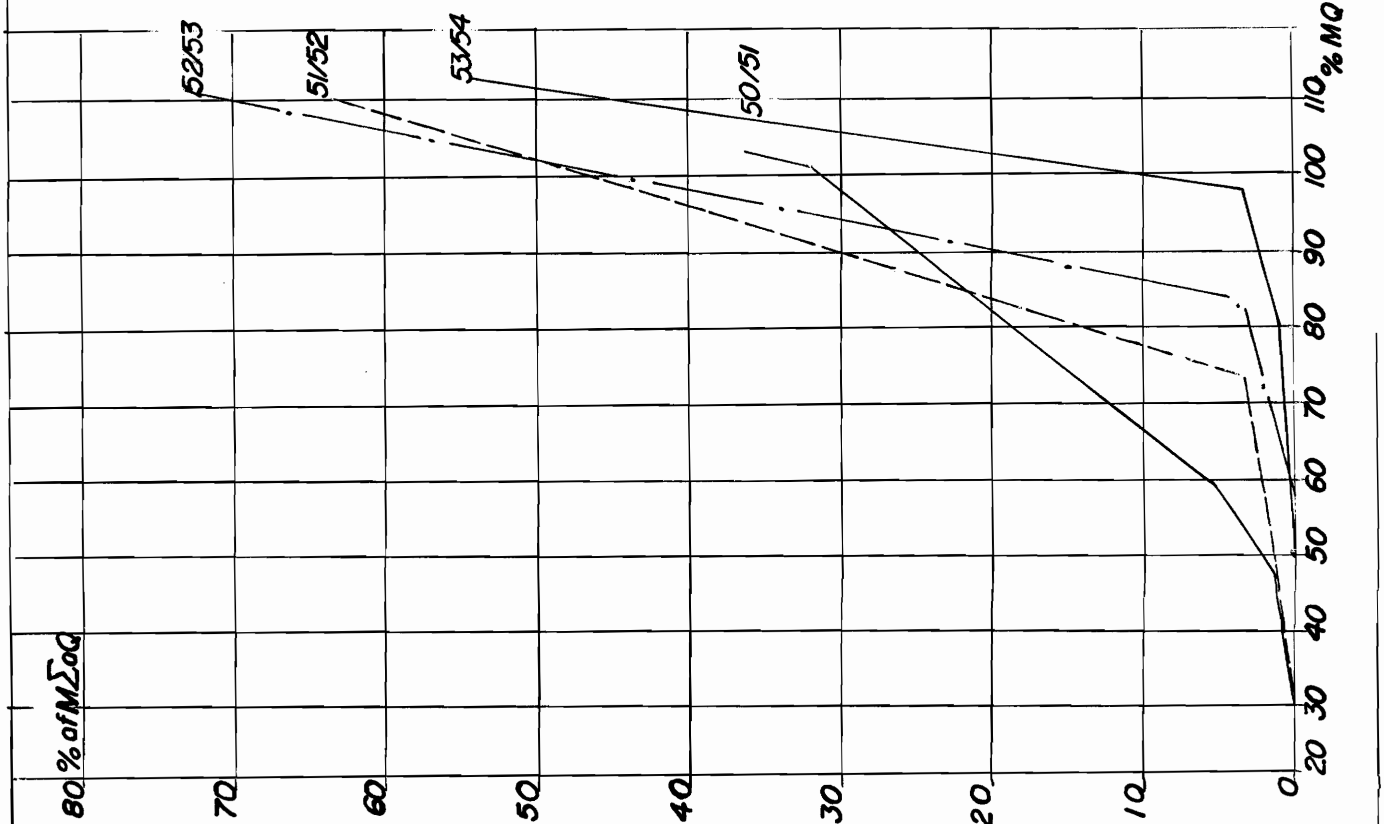


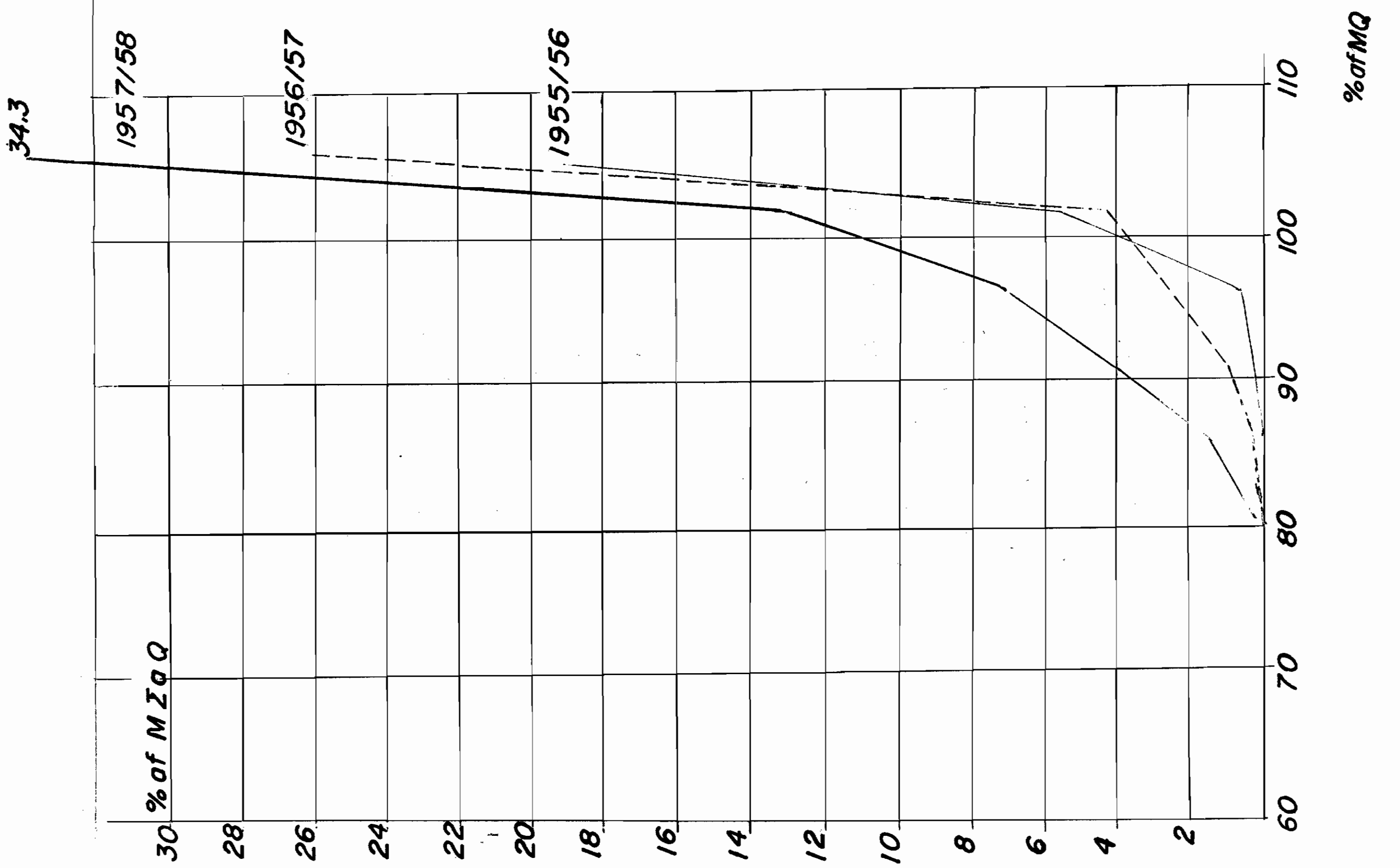
Fig 29 (opposite)

Tungufljót River at Faxi

Flow Regulation Curves for the Period of Record. (7 whole Water Years, 1951/58).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off (MΣaQ), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI Vatnamælingar TUNGUFLJÓT BRÚIN Jöfnunarlínur f. 7ár 1951 – 58	20.2 '59 P.J Tnr. 119 B-274 B3/68/3 Fnr. 4241



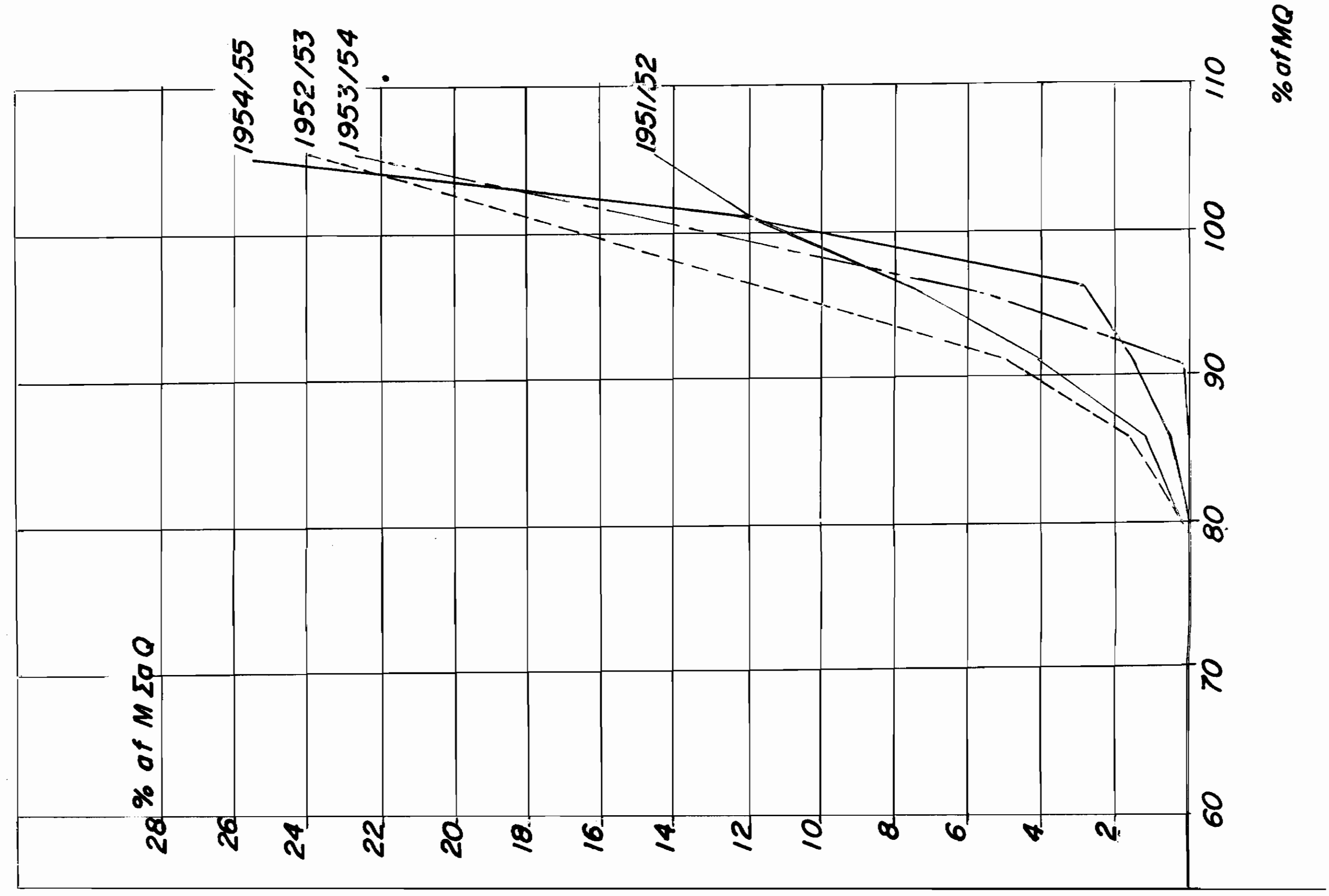


Fig. 30 (opposite)

Hvítá River at Gullfoss + Tungufljót River at Faxi

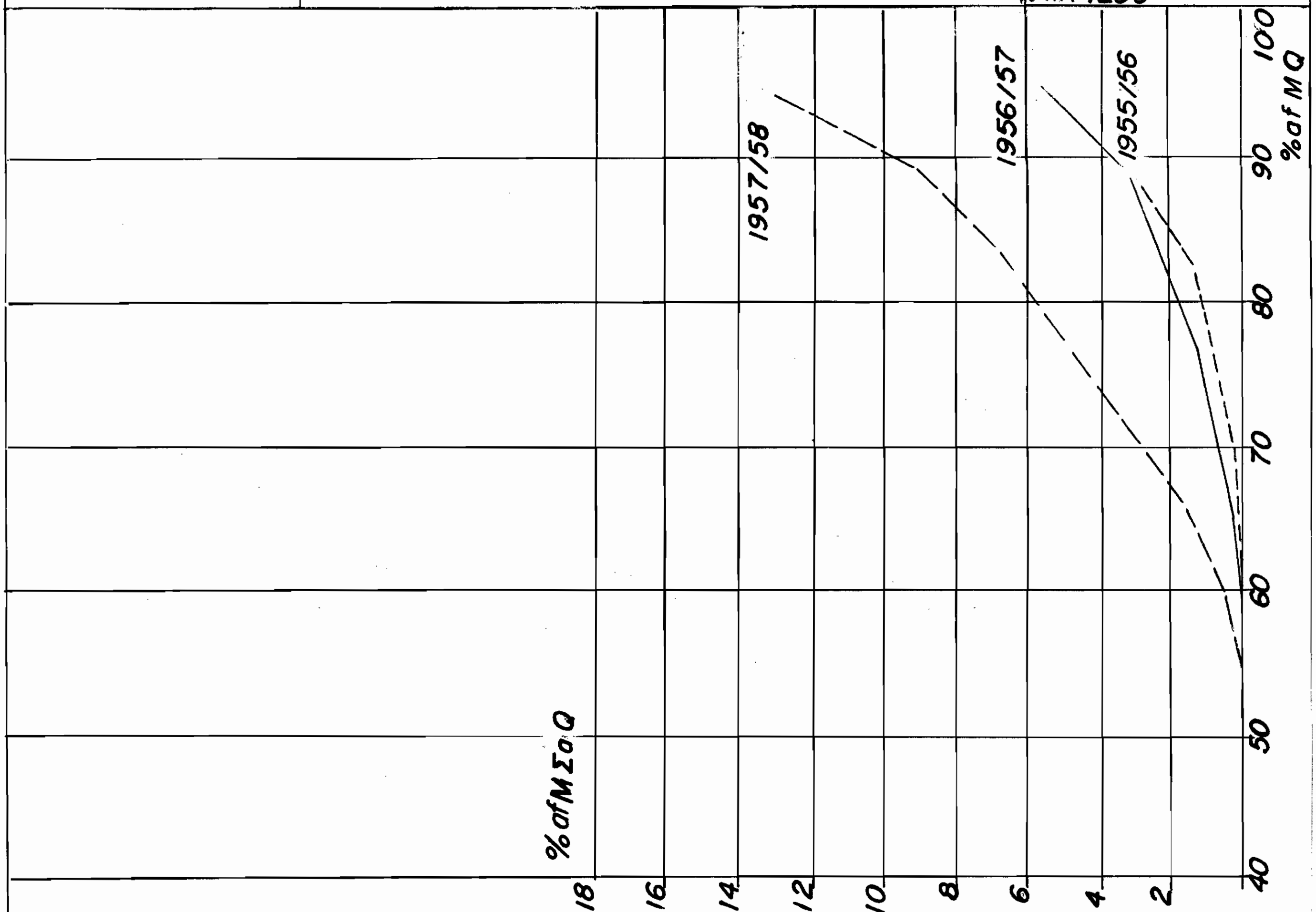
Flow Regulation Curves for the Period of Record at Both Water Gauges (7 whole Water Years, 1951/58).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar

TUNGUFLJÓT+HVÍTA
Jöfrunarl. 7ára 1951-1958

17.2.59 P.J	
Tnr 116	
B-274 B3-87+68/2	
Fnr. 4236	



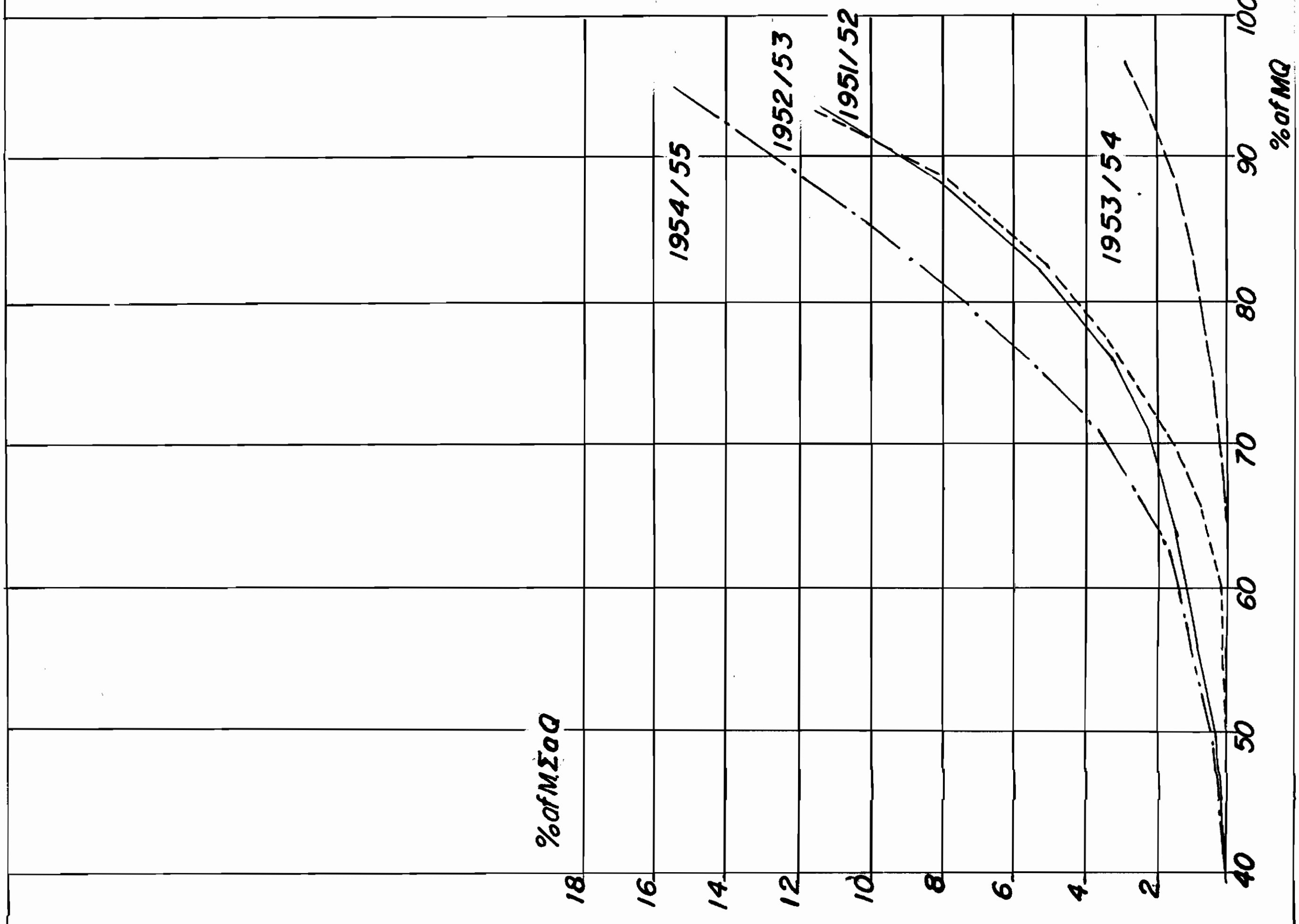


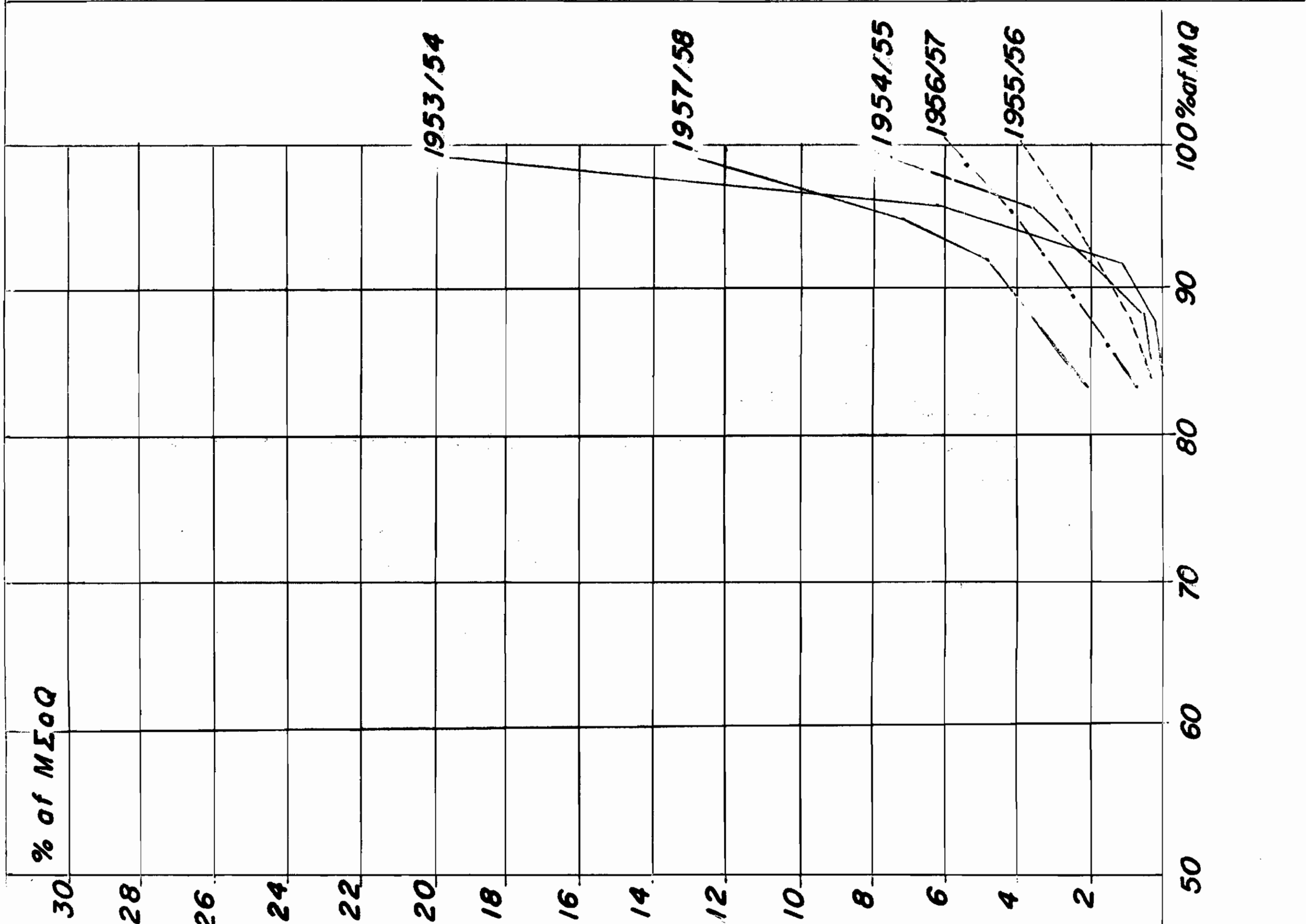
Fig. 31 (opposite)

Brúará River at Dynjandi

Flow Regulation Curves for the Period of Record. (10 whole Water Years, 1948/58).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

	RAFORKUMÁLASTJÓRI Vatnamælingar BRÚARÁ, DYNJANDI Jöfnunarlína fyrir 10 ár 1948–1958	13.2.'59 P.J. Tnr. 122 B-274 Vhm 43/2 Fnr. 4235



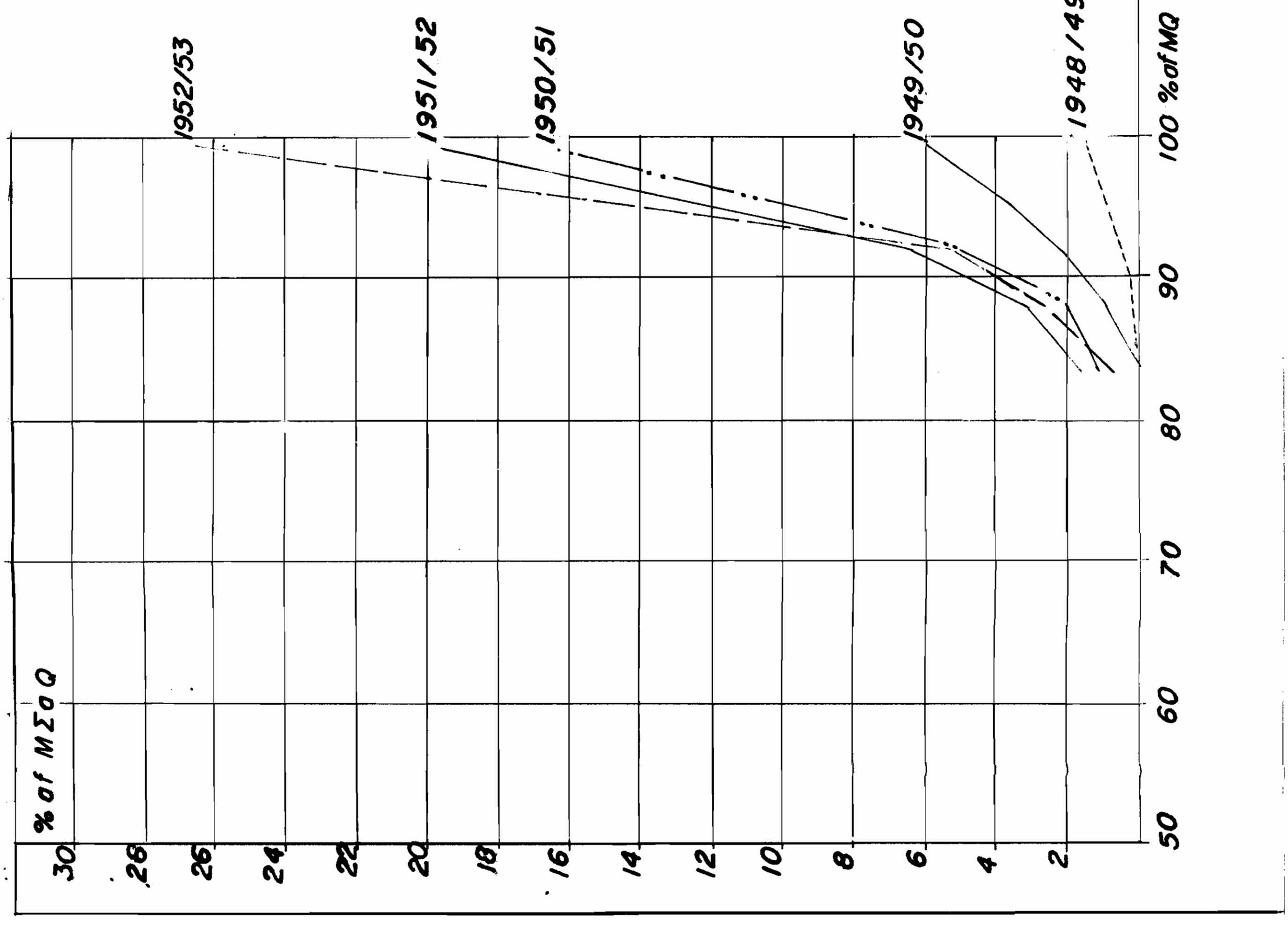


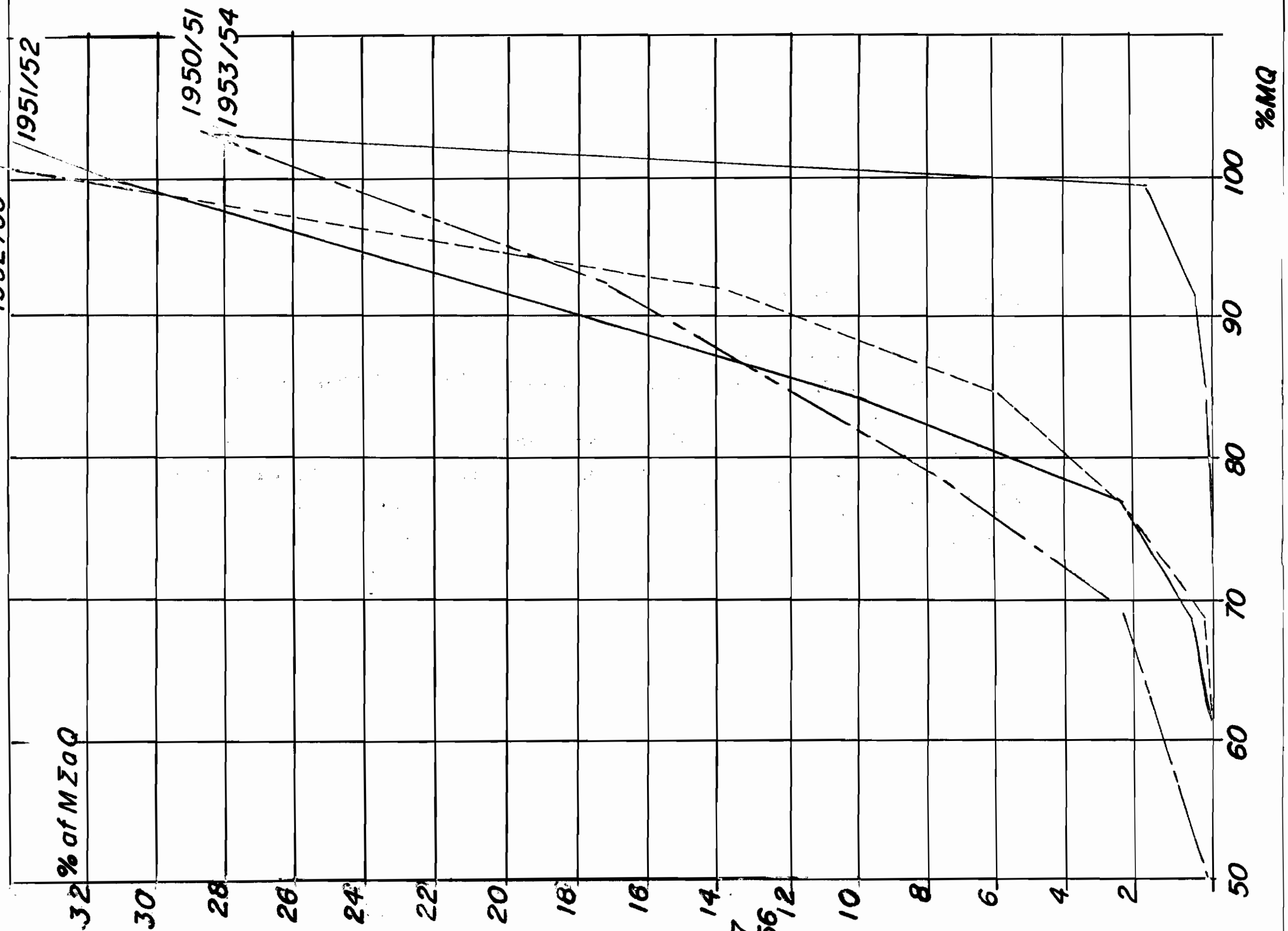
Fig. 32 (opposite)

Hvítá River at Hestfjall

Flow Regulation Curves for the Period of Record. (8 whole Water Years 1950/58).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI Votnamælingar HVÍTA, HESTFJALL Jöfnunarlína 8 ára 1950-58	12.2.'59 P.J Tnr. 115 B-274 B3-107/1 Fnr. 4212



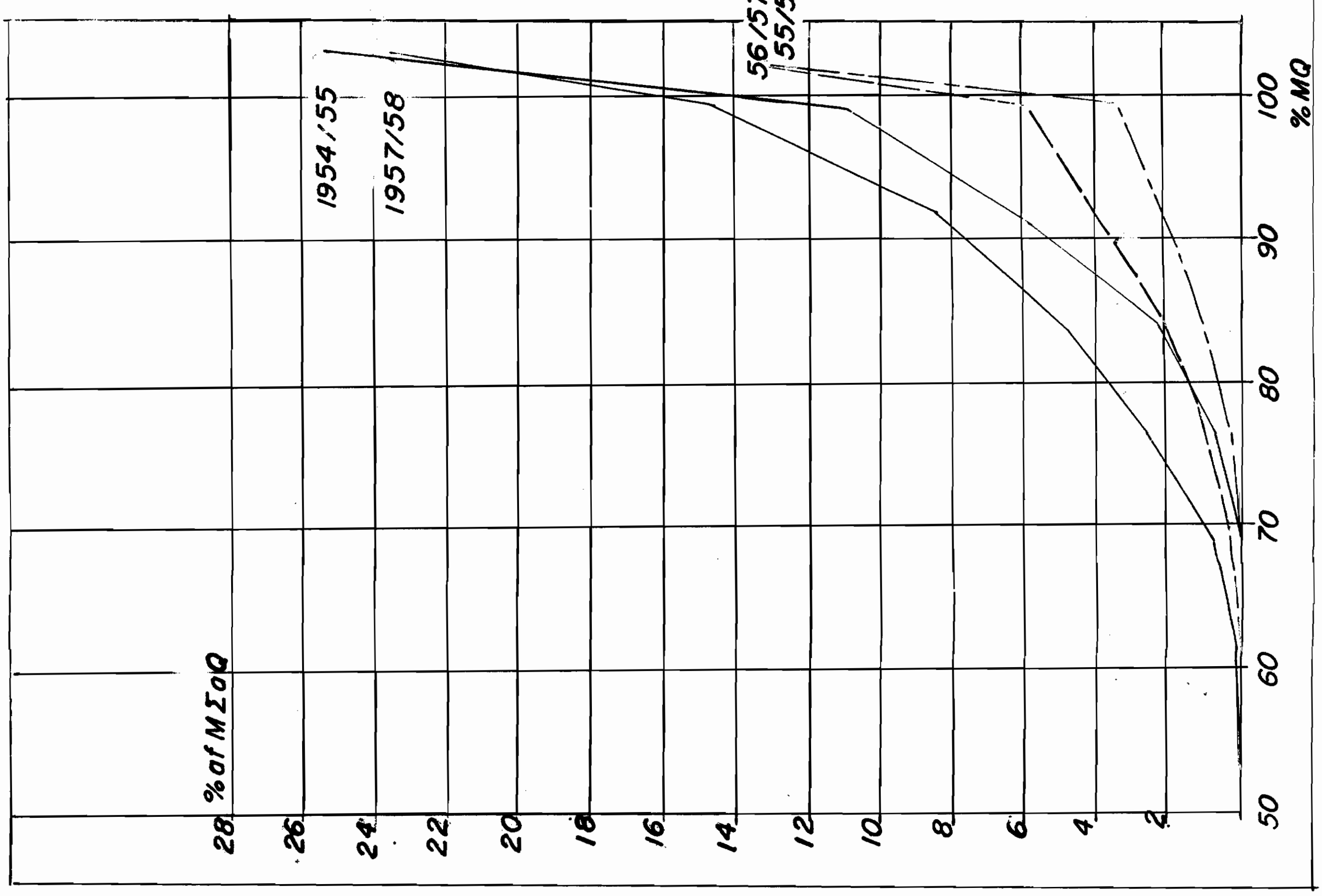


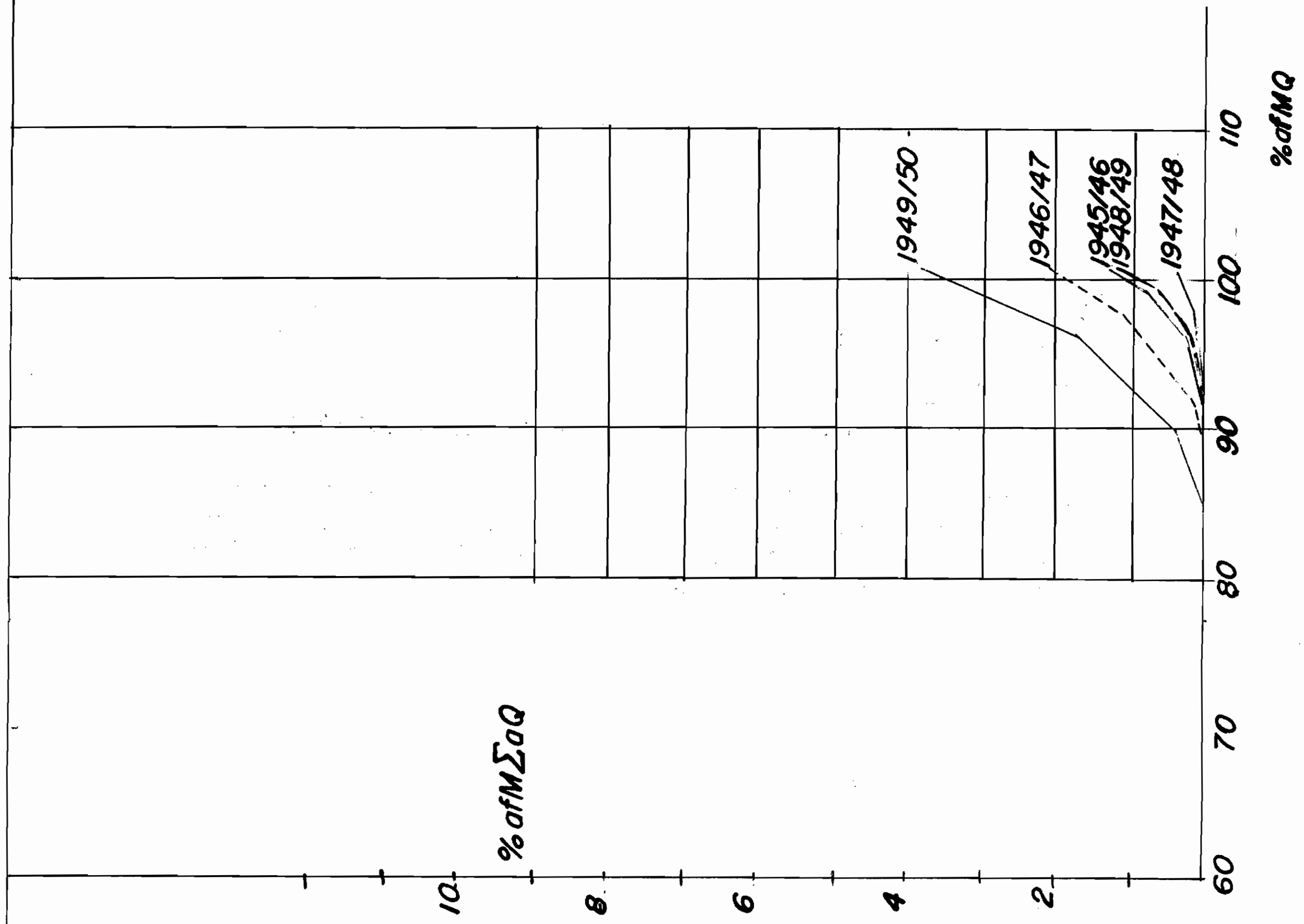
Fig. 33 (opposite)

Sog River at Ljósafoss

Flow Regulation Curves for the Water Years 1940/50.

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

	RAFORKUMÁLASTJÓRI Vatnamælingar SOGIÐ Jöfnunarlínur 10 ára 1940-50	253 '59 Þ.A/V.S Tnr. 97 B 18 Vhm 2/1 Fnr 4284



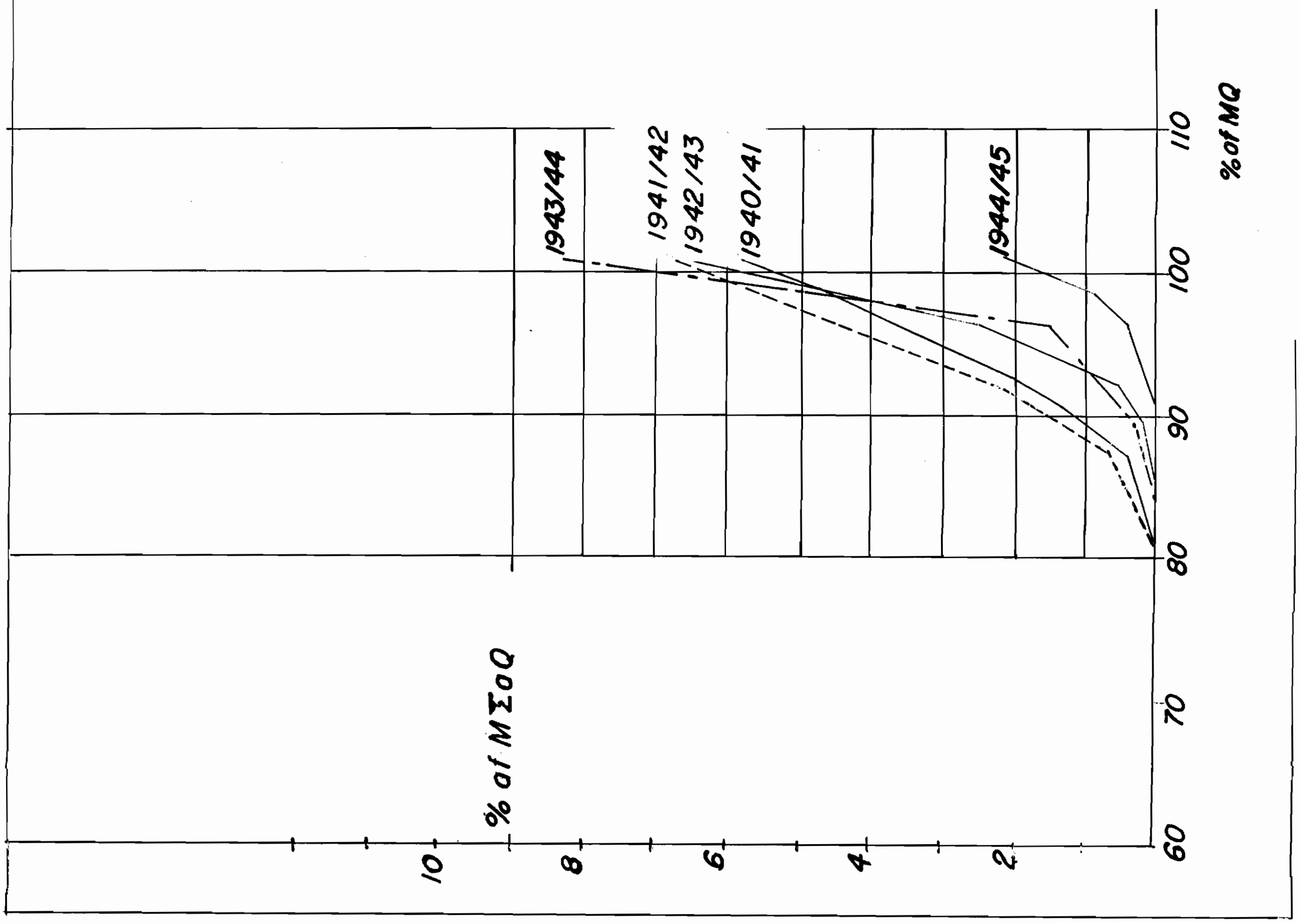


Fig. 34 (opposite)

Sog River at Ljósafoss

Flow Regulation Curves for the Water Years 1950/54.

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar
SOGIÐ
Jöfnunarlínur 4 ára 1951–54

25.3.'59 ÞA
Tnr 98
B 18 Vhm2/2
Fnr 4285

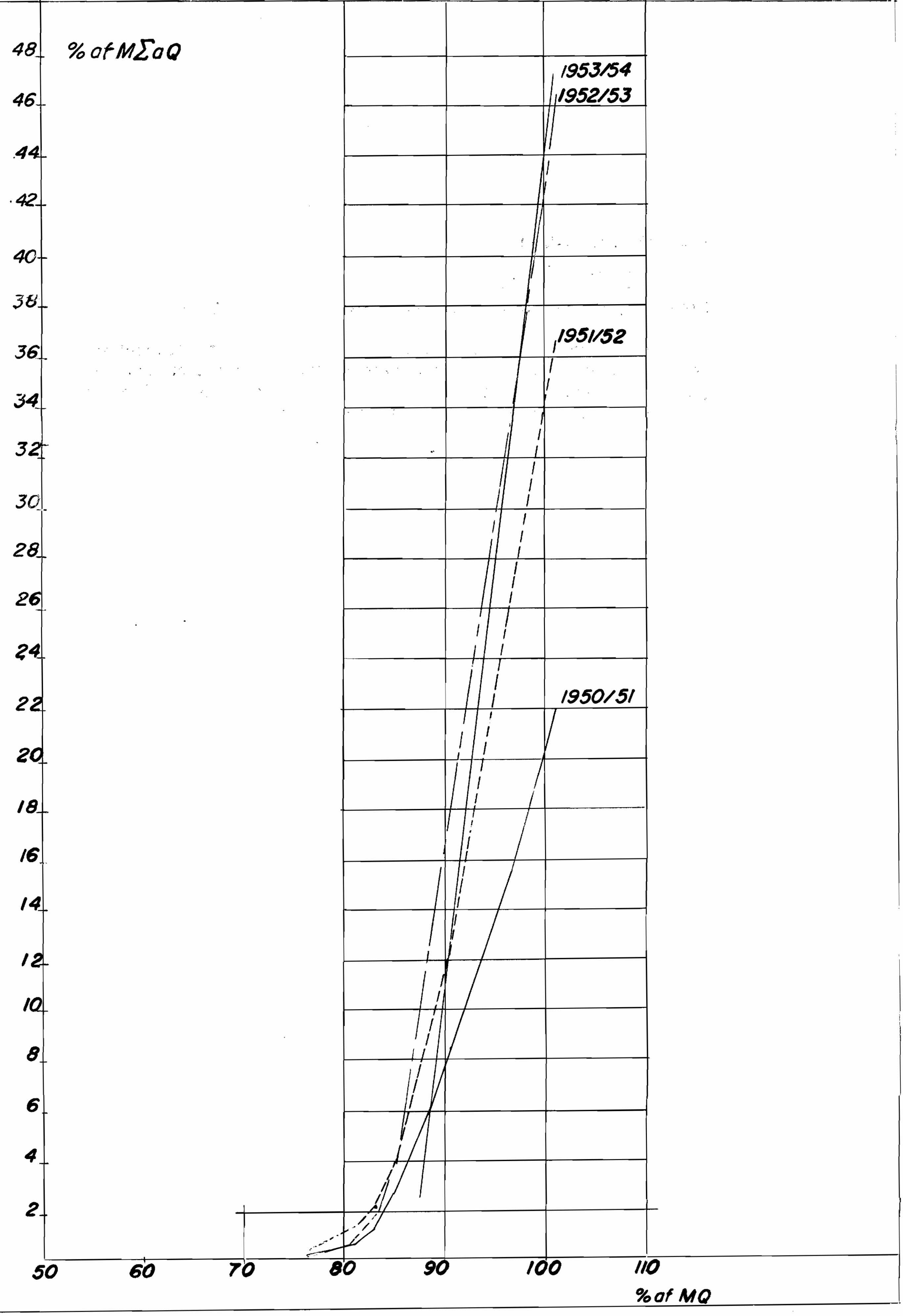


Fig. 35 (opposite)

Sog River at Ljósafoss

Flow Regulation Curves for the Water Years 1954/58.

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar

SOGIÐ

Jöfnunarlínur 4 ára 1954/58

25.3.'59 ÞA/VS
TNR 99
B18 Vhm 2/3
Fnr 4286

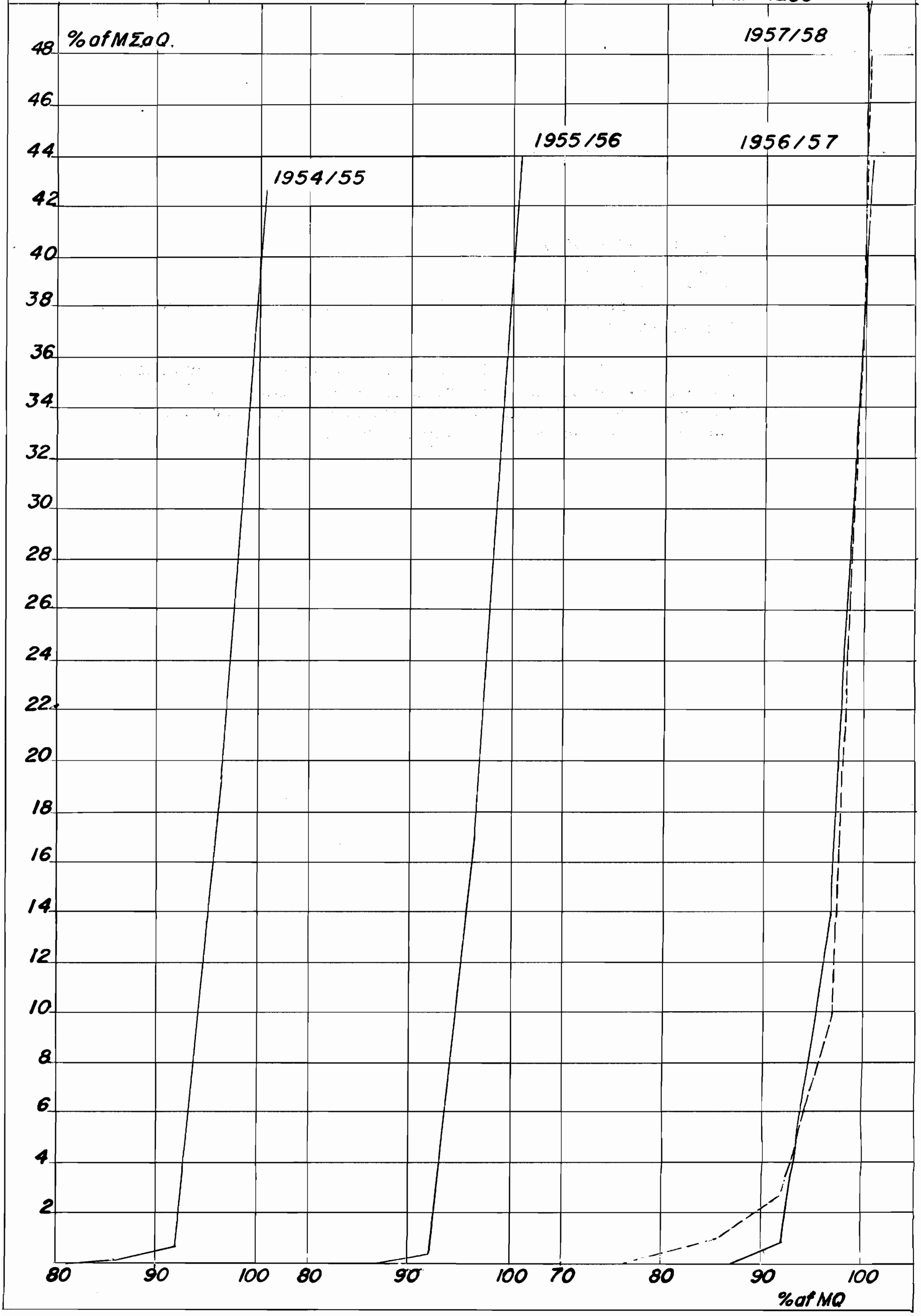


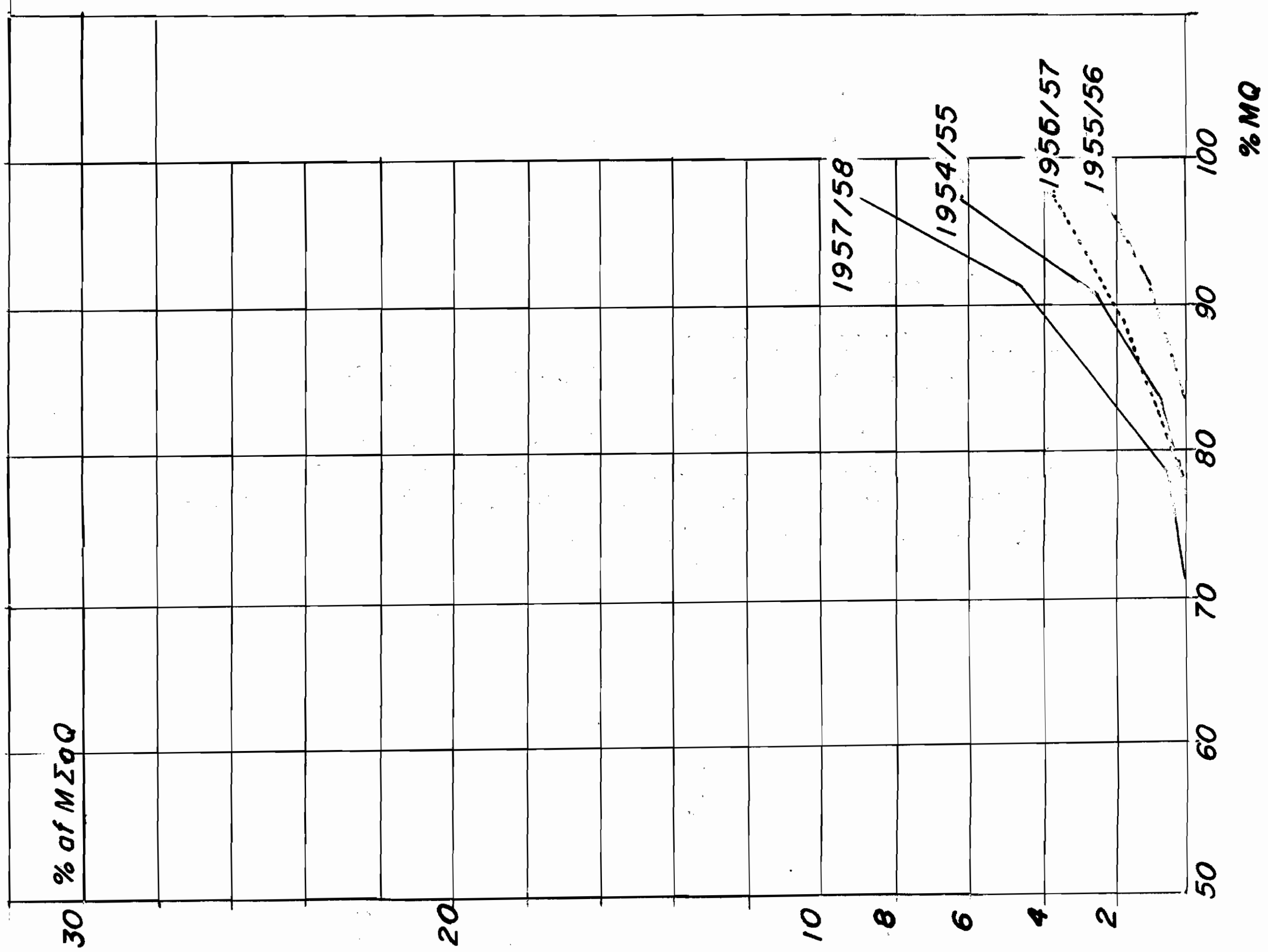
Fig. 36 (opposite)

Ölfusá River at Selfoss

Flow Regulation Curves for the Period of Record. (8 whole Water Years, 1950/58).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI Vatnamælingar ÖLFUSÁ, SELFOSS Jöfnunarlína fyrir 8 ár 1950-1958	9·2·'59 JB/PJ TNR 158 B 274 Vhm 6417 Fnr 4203



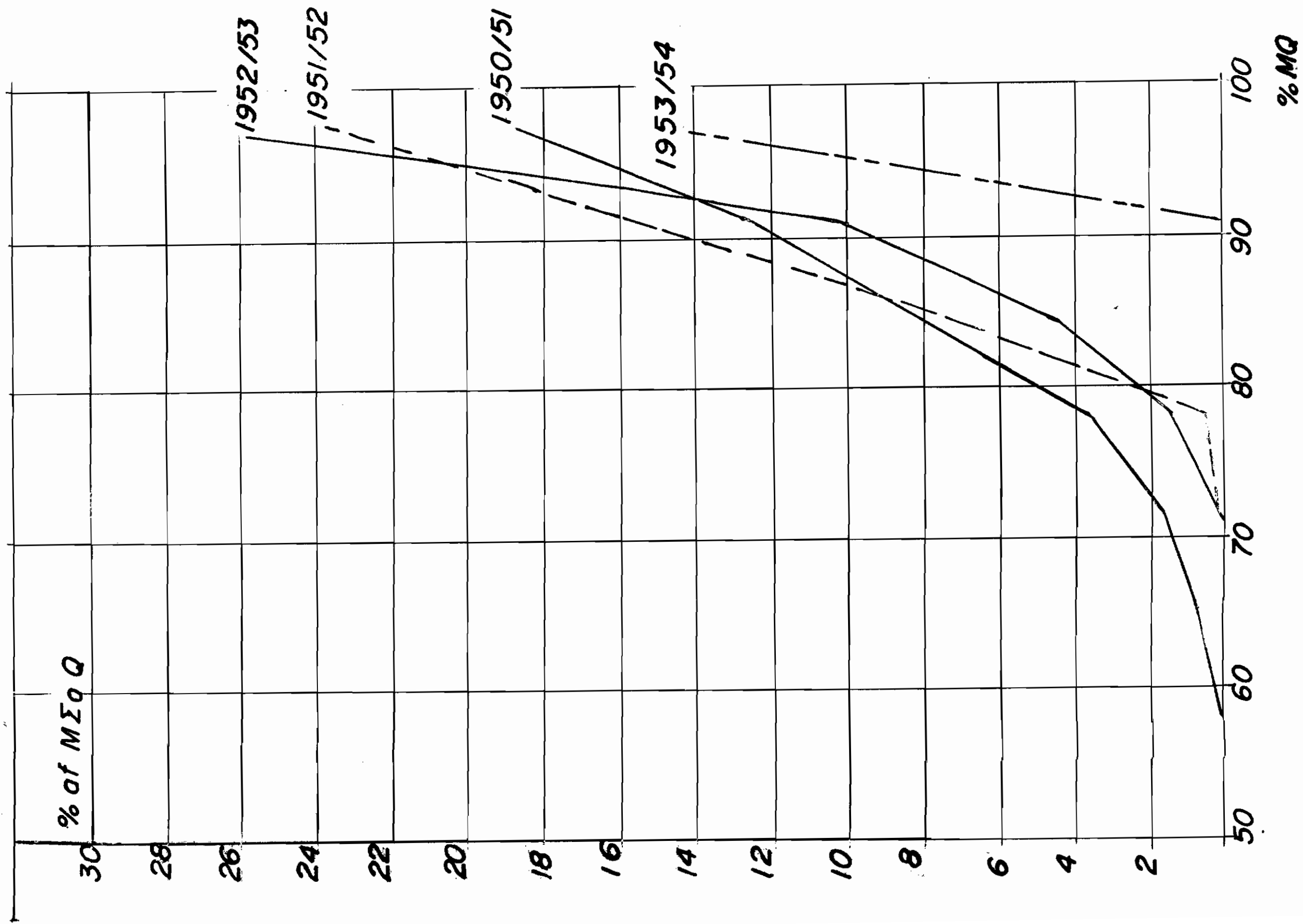


Fig. 37 (opposite)

Þjórsá River at Urriðafoss

Flow Regulation Curves for 10 Water Years (1947/57).

The curves show for each water year of record the amount of storage, expressed as a percentage of the mean annual run-off ($M\Sigma aQ$), required to ensure a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar

ÞJÓRSÁ, URRIÐAFOSS.
Jöfnunarlínur 10 ár.
1947-1957

24.6.'59 PJ	
TNR.	200
B-277 Vhm.30/26	
FNR. 4353	

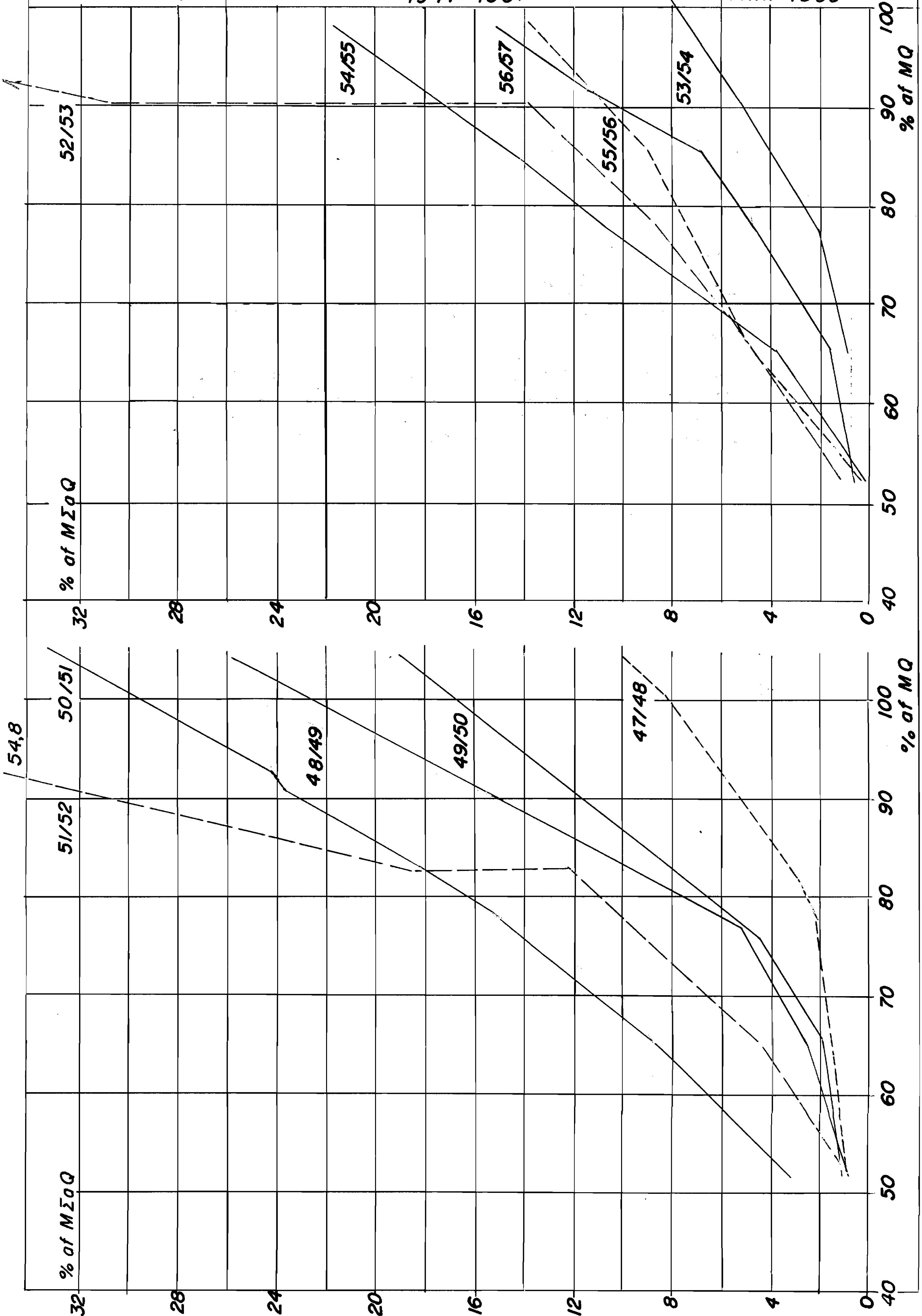


Fig. 38 (opposite)

Hvítá River at Gullfoss

Cumulative Storage Curves Based on 8 Water Years of Record (1950/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off ($M\Sigma aQ$) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar

HVÍTÁ, GULLFOSS
MIÐLUNARLÍNUR 8ÁRA
1950/58.

4.3.'59 JB/PJ
TNR. 112
B- 274 V
FNR. 4181

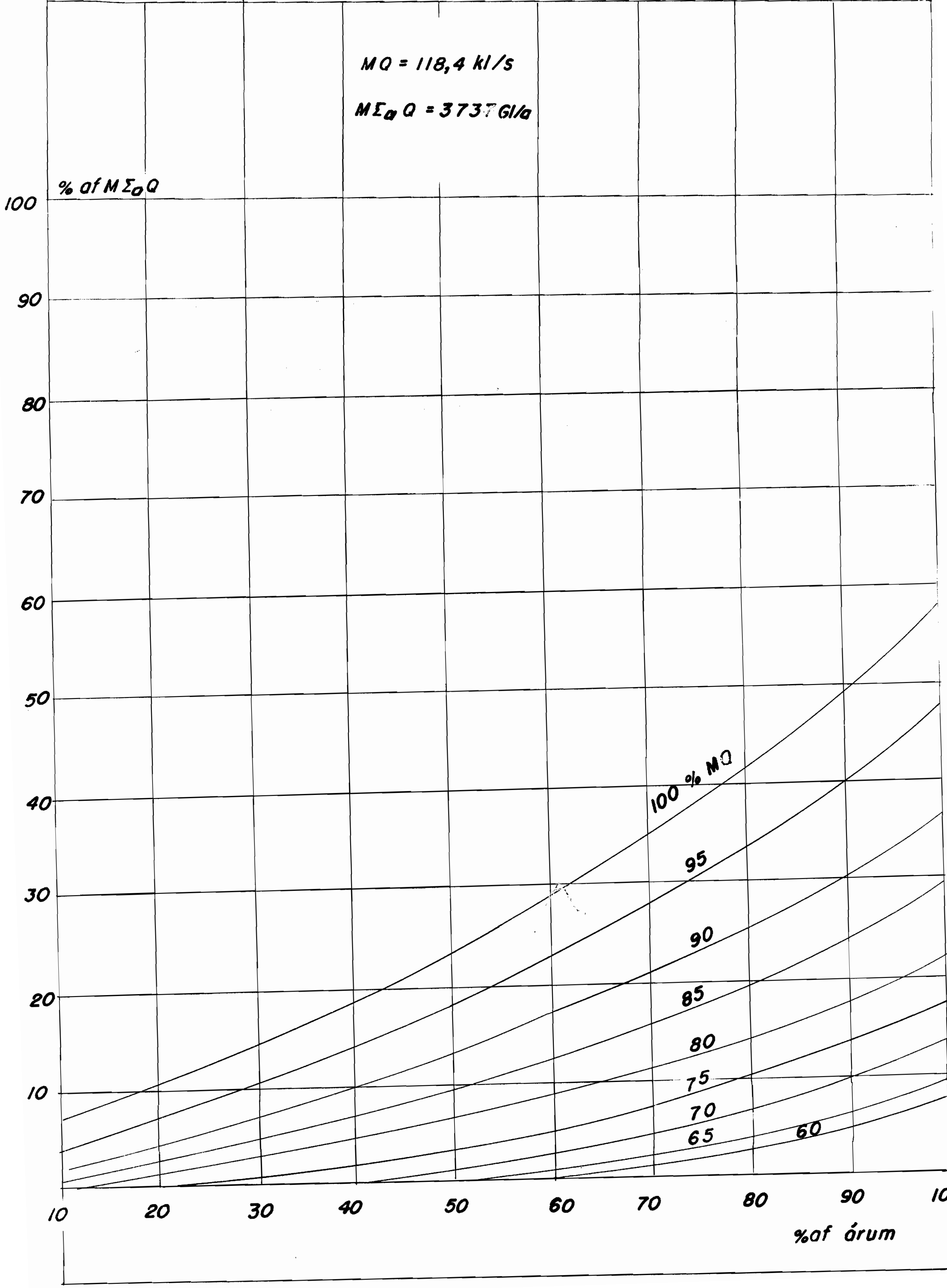


Fig. 39 (opposite)

Tungufljót River at Faxi

Cumulative Storage Curves Based on 7 Water Years of Record (1951/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off ($M\Sigma aQ$) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI.
Vatnamælingar

TUNGUFLJÓT v. brúna

Miðlunarlínur 7ára 1951–58

4.3. JB/VS
Tnr 129
B–274
Fnr 4258

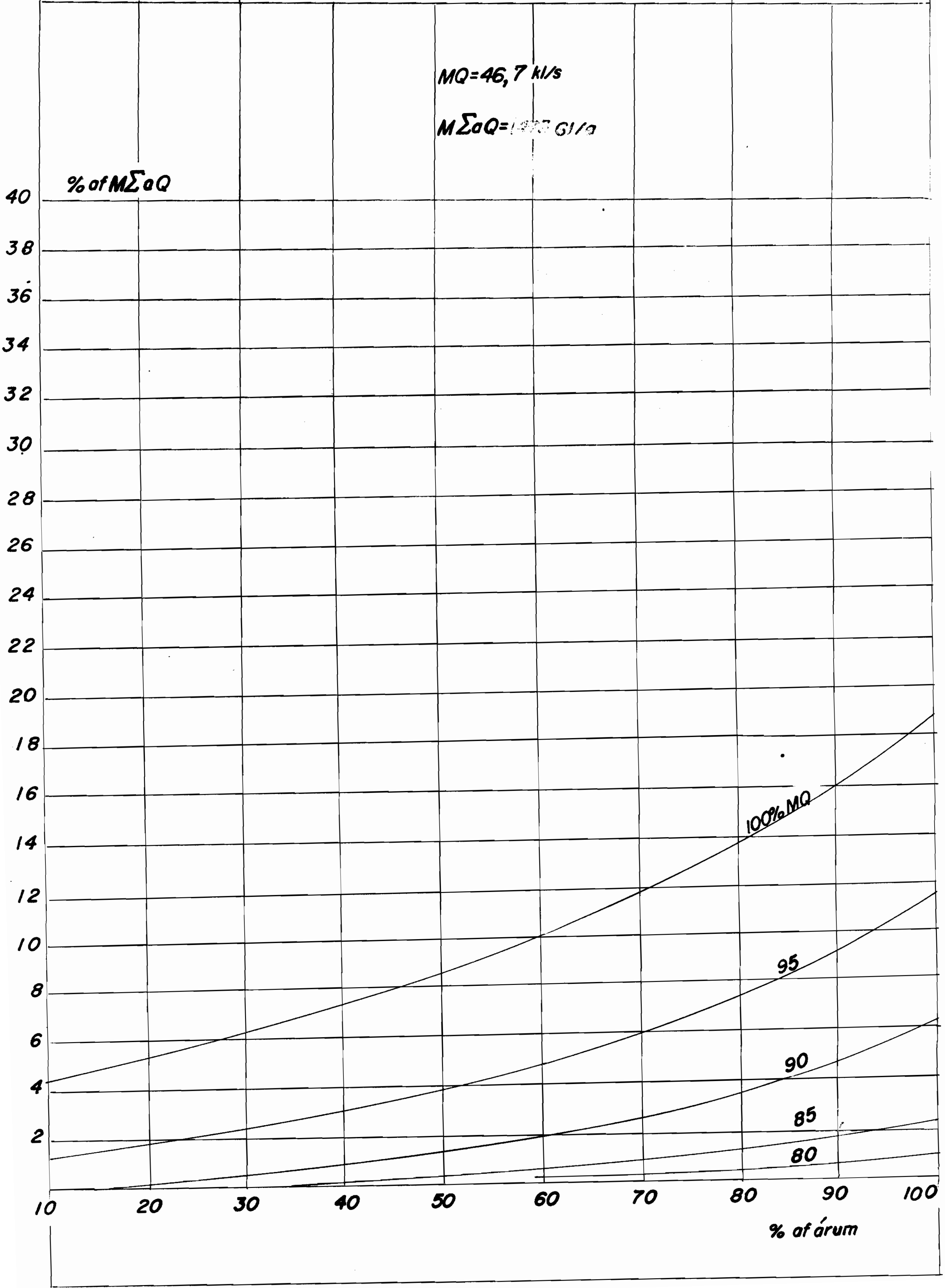


Fig. 40 (opposite)

Tungufljót River at Faxi + Hvítá River at Gullfoss

Cumulative Storage Curves Based on 7 Water Years of Record at Both Water Gauges, (1951/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off ($M\Sigma aQ$) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar.

TUNGUFLJÓT VIÐ BRÚ + HVÍTÁ, GULLFOSS.
MIÐLUNARLÍNUR 7-ÁRA 1950 / 58.

4.3.'59. JB / PJ.
TNR. 128
B- 274 V87+68/2
FNR- 4257

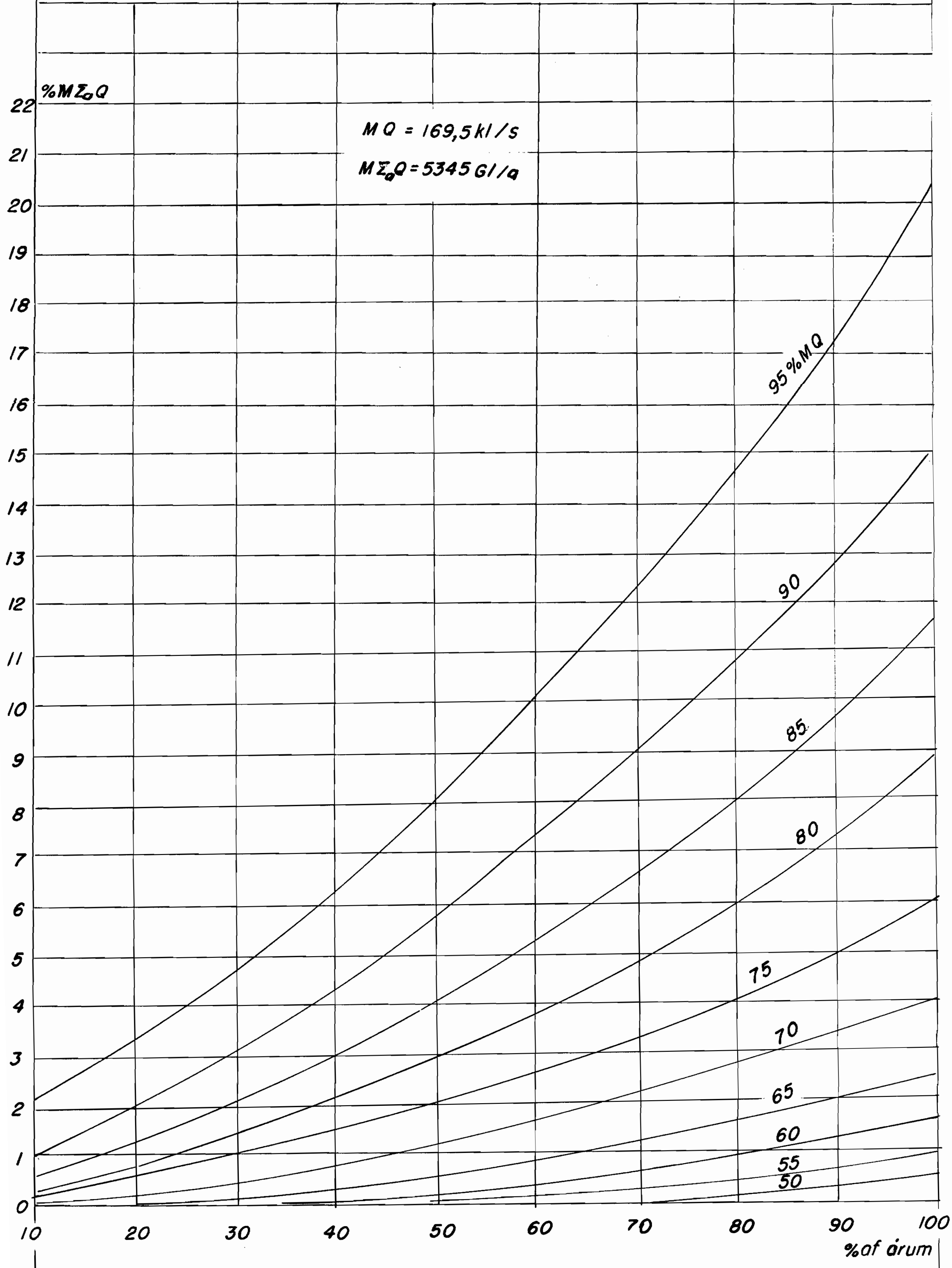


Fig. 41 (opposite)

Brúará River at Dynjandi

Cumulative Storage Curves Based on 10 Water Years of Record (1948/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off (MΣaQ) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI Vatnamælingar., BRÚARÁ, DYNJANDI. MIÐLUNARLÍNUR 10 'ÁRA 1948 / 58	4.3.'59 JB / PJ	
	TNR. 130	
	B-274	
	FNR. 4259	

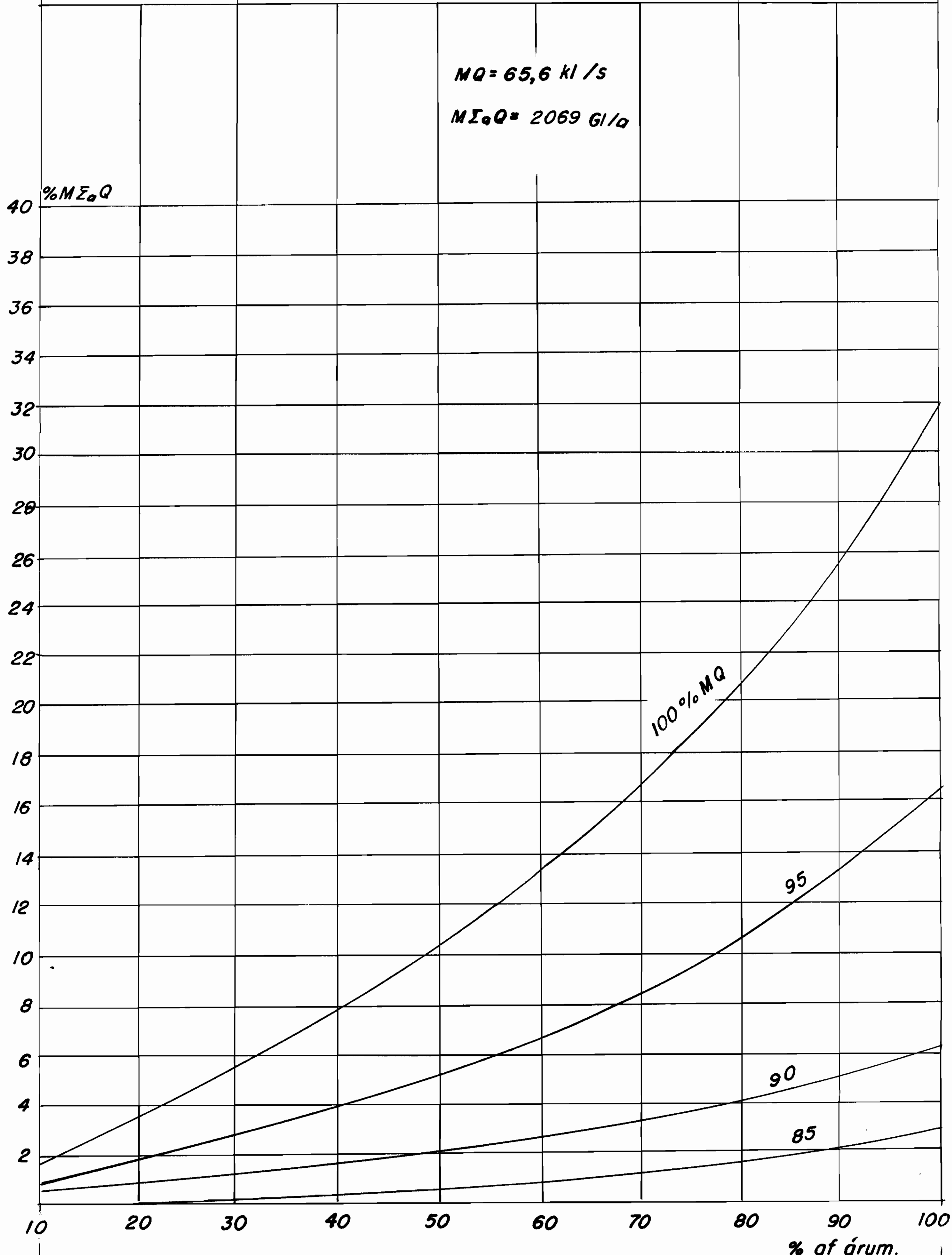


Fig. 42 (opposite)

Hvítá River at Hestfjall

Cumulative Storage Curves Based on 8 Water Years of Record (1950/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off ($M\Sigma aQ$) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar.

HVÍTÁ OFAN SOGS, HESTFJALL.
MIÐLUNARLÍNUR 8 ÁRA
1950/58.

4.3.'59 JB / PJ	
TNR. 117	
B - 274	
FNR. 4239	

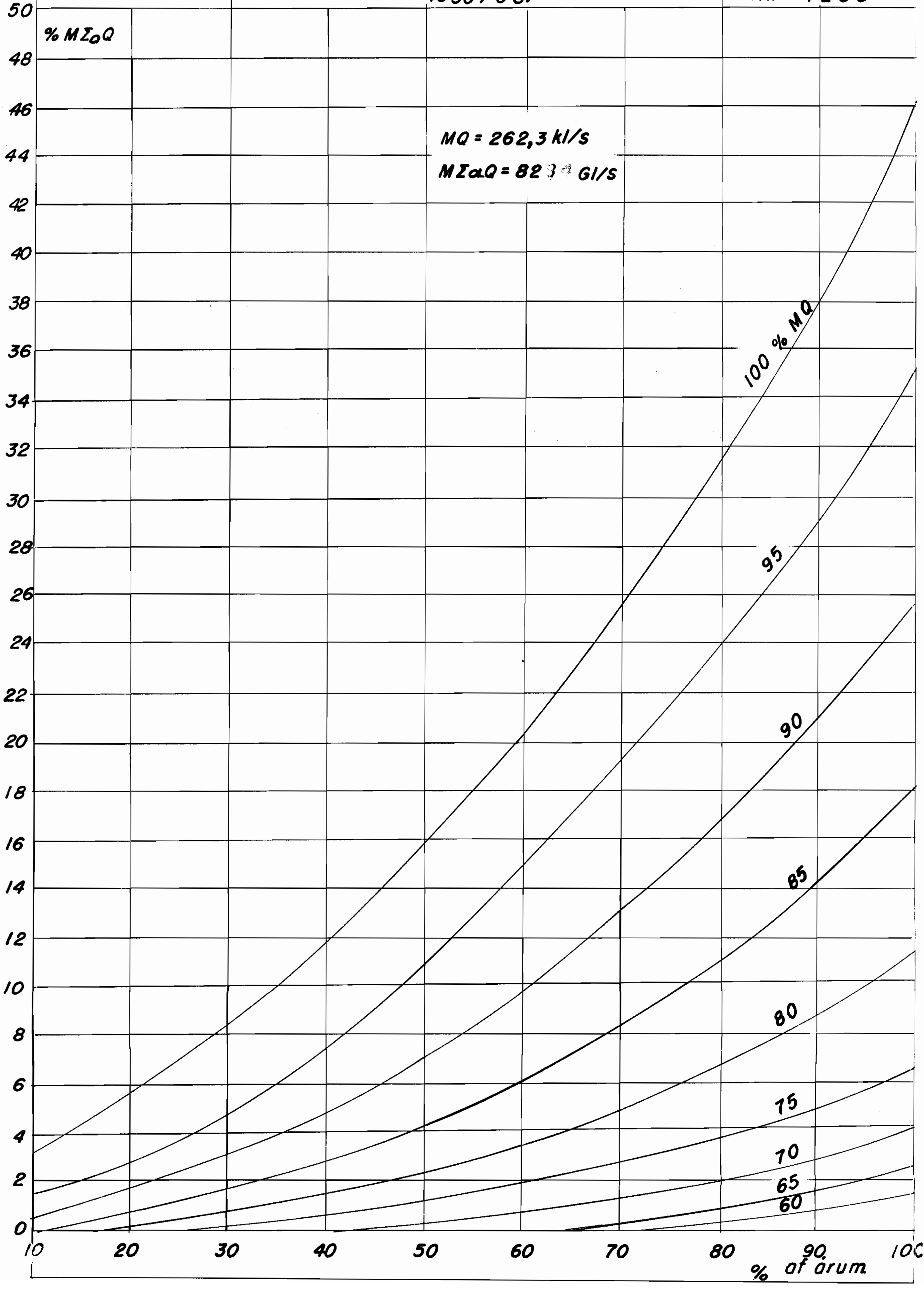


Fig. 43 (opposite)

Sog River at Ljósafoss

Cumulative Storage Curves Based on 18 Water Years of Record (1940/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off (MΣaQ) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar
SOGIÐ
Miðlunarlínur 18 ára 1940–58

8.3 '59 JB/VS
Tnr 100
B-18/Vhm 2
Fnr 4290

MQ = 111,6 kl/s

MΣaQ = 3519 Gl/a

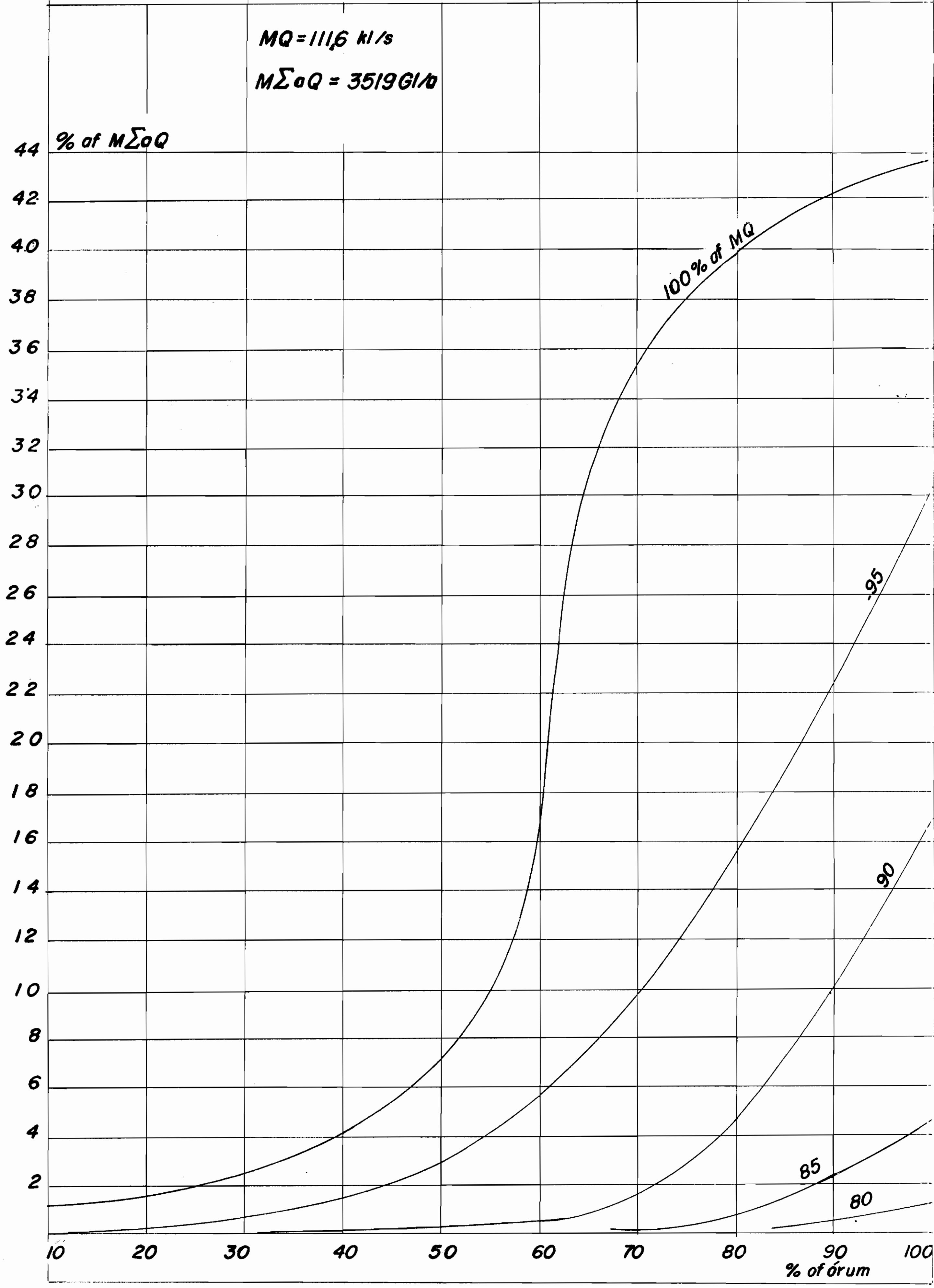


Fig. 44 (opposite)

Ölfusá River at Selfoss

Cumulative Storage Curves Based on 8 Water Years of Record (1950/58).

The curves show the amount of storage expressed as a percentage of the mean annual run-off ($M\Sigma aQ$) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

RAFORKUMÁLASTJÓRI
Vatnamælingar.

ÓLFUSÁ SELFOSS.
MIÐLUNARLÍNUR 8 ÁRA
1950 / 58

4.3.'59 JB / PJ
TNR. 118
B-274 V64/8
FNR. 4240

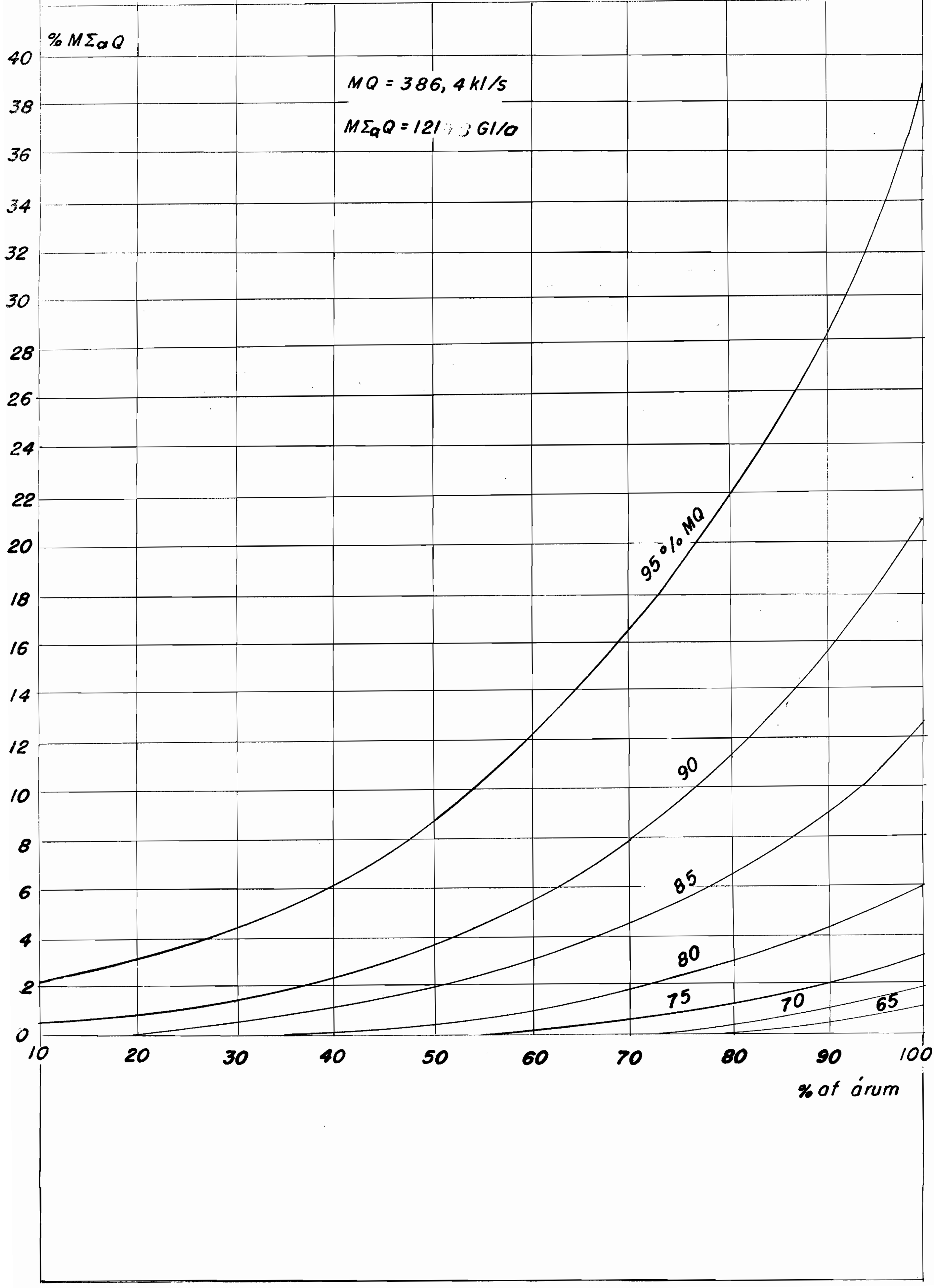


Fig. 45 (opposite)

Þjórsá River at Urriðafoss

Cumulative Storage Curves Based on 10 Water Years of Record (1947/57).

The curves show the amount of storage expressed as a percentage of the mean annual run-off ($M\sum aQ$) required to ensure in a given percentage of years a uniform discharge equivalent to any given percentage of the mean discharge.

	RAFORKUMÁLASTJÓRI *Orkudeild* **ÞJÓRSÁ, URRIÐAFOSS.** **Miðlunarlínur 10 ára** **1947-1957**	29.10.'58 VB/Eb
		TNR - 143
		B - 277
		FNR. 4093